RIVER CORRIDOR CONTRACT
INDEPENDENT BASE COST ESTIMATE

October 2001

Prepared for:

U.S. Department of Energy
River Corridor Remediation

Prepared by:

U.S. Army Corps of Engineers
Walla Walla District

NOTICE

EXECUTIVE SUMMARY

On January 31, 2001, the U.S. Army Corps of Engineers (USACE), Walla Walla District entered into an agreement with the United States (U.S.) Department of Energy (DOE), Richland Operations (RL) Office, to prepare an independent base cost estimate and schedule to support the River Corridor Closure (RCC) contract procurement actions. The base cost estimate and schedule development team members (RCC Team) were independent of any prospective bidders to the contract. The team collected and reviewed existing cost and schedule data in creating a "fair and reasonable" independent cost estimate for the life cycle duration of the contract. That estimate was released on the River Corridor Closure Project website in June 2001. Since that time, a combination of changes have occurred: workscope has been moved into Phase I from Phase II and additional site/facilities have been identified to be included within the RCC scope of work. This update is consistent with the workscope articulated in the Draft Request for Proposals (DRFP) which recently was released. Major elements that comprise the change are as follows:

- Phase I now includes clean-up of all waste sites and burial grounds in the B/C, D, F and H Reactor Areas, in addition to Interim Safe Storage (ISS) for the D,F, and H reactors and Hazard Mitigation for B Reactor
    - The remediation of an additional 205 waste sites (62 to 267)
    - The remediation of an additional 32 burial grounds (13 to 45)
    - The deactivation, decontamination, decommissioning, and demolition (D^4) of 22 additional buildings/structures (9 to 31)
- Phase II will now be focused on the K and N Reactor Areas and the 300 Area.
- Phase I is assumed to have an 8 year duration. Phase II is assumed to have a 4 year duration with completion by FY 2012 thereby requiring an FY 2009 start date.

  Obviously, numerous alternative scenarios were possible for consideration, particularly in light of the draft RFP reflecting a term to 15 years for the RCC contract. However, the scenario that was chosen was to ensure that the contracting approach being used remained consistent with the goal of completing the River Corridor cleanup by FY 2012. The Department of Energy (DOE) considered including alternative funding scenarios for this estimate and decided that little would be accomplished

by doing so. This was particularly true since the funding that will ultimately be furnished to the RCC project is uncertain and is dependent upon the proposal received from the successful offeror and the performance of that offeror on the RCC project.

The overall RCC Team Independent Base Cost Estimate results are presented in detail in the RCC Base Cost Estimate Tabs. Included is the following:

- **RCC Base Cost Estimate (includes Phase I and Phase II)**. The Base Cost estimate assumes $190M per year funding level over eight years for Phase I. Notwithstanding the offerors providing an optimum case, Phase II project completion was assumed to be within 4 years but no later than FY 2012. Total Project Cost, including allowances for uncertainties and external variables (referred to cumulatively, for purposes of this report, as "contingency") is equal to $2,760,967K at the 80% confidence level ($1,509,512K for Phase I and $1,251,455K for Phase II).

Included in the Tabs are the following:

- Tab 1 RCC Base Schedule
- Tab 2 RCC Base Cost Estimate Report, Summary by Project Baseline Summary (PBS) and Zone
- Tab 3 RCC Base Cost Estimate Report, Summary by Zone and Function
- Tab 4 RCC Base Cost Estimate Report, Summary by Site / Facility Activity

Within the Summary by Site / Facility Activity, in addition to the confidence level estimates utilized by the RCC Team, we have also added 50% and 80% confidence level estimates calculated on the basis of each individual site/facility activity. This information is included to provide greater visibility of the range of uncertainty for each site/facility activity.

An Appendix C, Site / Facility Cost Breakdown has also been included that reflects cost elements that make up site/facility cost estimates.

Completing the independent base cost involved four major steps:

1) Compiling the RCC contract scope, cost and schedule data
2) Developing an independent base cost estimate
3) Performing a risk based analysis of uncertainties and external variables

4) Developing an independent base schedule

The cost data utilized to formulate the RCC Independent Base Cost Estimate is based on information provided and generated from multiple databases and sources, each of which included unique overhead and other rates applied. Cost and schedule data sources included the Bechtel Hanford Inc. database, the Fluor Hanford POWERtool database, and the 300 Area Accelerated Closure Project (ACP) schedule. Cost data for certain projects such as the 100 Area miscellaneous underground piping was unavailable and thus had to be generated separately. The RCC Team compiled and normalized this diverse data into a single database to formulate the Independent Base Cost Estimate and Schedule. The normalization process included removing overhead and other rates, then applying RCC Base labor rates and re-applying consistent markups including general and administrative (G&A) and direct distributable costs. Figure 4.1 in the report is a flow diagram of the overall process used in developing the RCC Base Cost Estimate.

The RCC Team was challenged with analyzing more than 1,100 cost estimates in the RCC contractor's scope of work. Estimate types ranged from simple spreadsheets to parametric models to detailed definitive estimates. The team chose to divide the estimates into "model types." Model types were first reviewed from the perspective of making specific adjustments. If deemed appropriate, adjustments were made to certain labor categories and/or other costs. For example, engineering hours were reduced in several decontamination and decommissioning (D&D) model types. Reference Appendix A, Labor Rates, Adjustments, and Adders for a comprehensive listing of model adjustments.

The RCC Team also developed cost ranges for model types by grading them on three relevant criteria: scope definition, quantities development methods, and cost estimate pricing. Potential ranges were established for each criterion for each model type. The three criteria were weighted for relative importance based on potential effect to the estimates. A simulation for each model type resulted in additional adjustments to the baseline facility estimates. All of the adjustments are summarized in Appendix A, Labor Rates, Adjustments, and Adders.

It is important to note that the initial analysis and revisions were performed strictly on the model types for the purpose of developing independent cost estimates at the site facility level. The effects of uncertainties and external variables were considered separately.

A risk-based analysis was performed to account for:

- Uncertainties encountered during execution of cleanup activities
- The potential extreme variances from the base estimate before uncertainties are applied to individual projects
- External and other risk variables (such as weather, labor and equipment issues, productivity effects)

The RCC Team utilized Crystal Ball™, a DOE accepted commercially available personal computer based forecasting and analysis program, to run simulations for developing the final base cost adjustment for uncertainties. The simulation included all individual base cost estimates and certain external risk variables. The total base cost was grouped into three distinct forecast categories:

1) High-Risk Projects
2) Remaining Projects
3) Risk Variables (External)

High-risk projects included all underground remediation work (burial grounds, liquid sites, and remaining sites), N and K Area Reactors Interim Safe Storage (ISS), the 324 and 327 deactivations, and other selected deactivation projects. Remaining projects included D&D, remaining deactivation, mobilization, design, ongoing reactor ISS, utility isolation, new contract transition, Surveillance and Maintenance (S&M), Environmental Restoration Disposal Facility (ERDF) operations, and Project Management and Support (PM&S). The risk variables (external) are listed in Table 4.2 in the report.

During the uncertainties and external variables development, the RCC team was directed to NOT include any significant changes from what presently exist in the following:

- Changing of regulations and/or interpretation of regulations
- Funding availability
- Current non-River Corridor project assumptions
- Intervention by outside groups

The results of the analysis of uncertainties and external variables based on a representative sampling of data are depicted in Table 4.4. Table 4.5 and Table 4.6 show the actual estimates for uncertainties and external variables used in the development of the RCC Independent Base Cost Estimate.

The basis for sequencing the work for the RCC Base Schedule was established after reviewing existing on-site prioritization methods, the ACP plan schedule, and the Multi-Year Work Plan (MYWP) current baseline schedule. A work breakdown structure (WBS) was adopted by the RCC Team to show the responsibility and deliverable requirements of the RCC contractor, as follows:

A. River Corridor Restoration
B. Project Baseline Summary
C. Zone
D. Function
E. Site/Facility

The base schedule has been developed at the Function level and includes design, mobilization/demobilization, remediation of liquid waste sites, remediation of burial grounds, remediation of waste sites, special projects, ISS, S&M, deactivation, D&D, utilities isolation, waste operations, and PM&S. The functions are specific manageable units that could be logically scheduled. The Tri-Party Agreement milestones were found to be achievable.

The assumed funding is:

- Phase I: $190 million/year for eight years
- Phase II: That required to complete within four years but no later than FY 2012

TABLE OF CONTENTS

TABS

1. RCC Base Schedule
2. RCC Base Cost Estimate Report, Summary by PBS and Zone
3. RCC Base Cost Estimate Report, Summary by Zone and Function
4. RCC Base Cost Estimate Report, Summary by Site / Facility Activity

APPENDICES

A. Labor Rates, Adjustments, and Adders
B. Estimate and Uncertainty Ranges
C. Site / Facility Cost Breakdown

LIST OF TABLES

LIST OF FIGURES

1. INTRODUCTION

On January 31, 2001, the U.S. Army Corps of Engineers (USACE), Walla Walla District with Project Time & Cost, Inc. (PT&C) as a subcontractor, entered into an agreement with the United States (U.S.) Department of Energy (DOE), Richland Operations Office (RL), to prepare an independent base estimate to support the River Corridor Closure (RCC) contract procurement actions. Work began on February 5, 2001 and is scheduled for completion by July 5, 2001.

A joint team from the USACE, Walla Walla, Washington, the USACE Galveston, Texas, and PT&C compiled the base estimate. The RCC Team members are independent of any prospective bidders to the RCC contract and consisted of the following individuals:

Kim Callan, P.E., CCE	Project Manager
Volker Schmidt, P.E., CCE	Deputy Project Manager
Gary Haddle, CCC	Lawrence Geren
Mike Deiters, P.E., CCE	Tom Humphries, P.E., CCE, PMP
Andy Reape, CCE, PMP	Simon Jackson, CCE
Jim Prock, CCE, PMP	

2. BACKGROUND

2.1 SITE AND REGIONAL INFORMATION

The Hanford Site is a geographically diverse land area in southeastern Washington State. The Hanford Site is bisected by the last free flowing stretch of the Columbia River and contains large areas of pristine shrub steppe habitat. It is also included on the Comprehensive Environmental Response Compensation and Liability Act of 1980 (CERCLA) National Priorities List (NPL) of contaminated sites requiring cleanup actions.

According to the Hanford Remedial Action Environmental Impact Statement and Comprehensive Land Use Plan (DOE/EIS 0222-F) about 4 percent of the site is surface contaminated and 30 percent of the site overlays groundwater contaminated from the past production of defense nuclear materials. The proximity of the contaminated surfaces and sub-surfaces to the Columbia River makes the cleanup of the Hanford Site paramount.

Over the past year, the U.S. DOE-RL has been formulating a focused vision for the future of the Hanford Site that builds on Hanford's extensive progress to date

while continuing to embrace the priorities of the regulators, stakeholders, and area Tribal Nations.
The three elements of that plan, called "Hanford 2012," are to:

1) **Restore the Columbia River Corridor**. Successful cleanup of the River Corridor, which includes a portion of the recently designated Hanford Reach National Monument, will allow more than 200 square miles of Hanford land to be released for other uses, provide opportunities for public access to key recreational areas, protect cultural resources, and decrease the footprint for active Hanford cleanup operations to approximately 75 square miles.

2) **Transition the Central Plateau**. DOE is transitioning the Central Plateau from primarily waste storage to active waste treatment, storage, and disposal operations. New, state of the art, environmentally compliant facilities will be used to support completion of the Hanford cleanup as well as to support the DOE Office of River Protection tank waste mission. Some of these facilities, including the Canister Storage Building and Waste Receiving and Processing Facility have begun operation already.

3) **Prepare for the future**. The plan includes working with the community to understand their vision and effectively leverage Hanford resources including the Pacific Northwest National Laboratory (PNNL), the Hazardous Materials Management and Emergency Response (HAMMER) Training and Education Center, land, facilities, equipment, intellectual property and technologies, infrastructure and service capabilities, and a skilled workforce to create research opportunities and economically linked new business and industries.

This Independent Base Cost Estimate focuses on the first of these elements, "Restoring the River Corridor".

2.2 RIVER CORRIDOR RESTORATION PROJECT INFORMATION

The River Corridor is a 210 square mile area on the Hanford Site that is adjacent to the Columbia River. This area is divided into three major sub-areas, the 100 Area that is comprised of shut down plutonium production reactors and support facilities; the 300 Area that is comprised of reactor fuel fabrication, research and support facilities; and the 600 Area. The 600 Area is mostly vacant land, but contains a number of waste sites that require remediation. The 100 and 300 Areas are on the Environmental Protection Agency (EPA) NPL and are two of the three open NPL sites at the Hanford Site with the other being the 200 Area (which is not part of the River Corridor).

The 100 Area is located in the northern portion of the Hanford Site. It encompasses approximately 26 square miles and is bisected by the Columbia River. The portion south and west of the river is the site of six reactor areas (100-B/C, 100-D, 100-F, 100-H, 100-K, and 100-N) along with numerous other waste sites primarily associated with the first decade of Hanford construction and production operations. The portion north and east of the river is the North (or Wahluke) Slope, which contained contaminants remaining from anti-aircraft missile bases (but is not considered part of the River Corridor scope). See Figure 2.1 for a map of the 100 Area.

There are nine nuclear reactors spread among six reactor areas (two each at 100-B/C, 100-D/DR, and 100-K East/ K West, and one each at 100-F, 100-H, and 100-N). The first eight reactors, which were constructed between 1944 and 1955, used Columbia River water in a single-pass process for cooling the reactor core. Water was either discharged back to the river or diverted to onshore liquid waste disposal sites such as cribs. This discharged cooling water contained hazardous waste constituents and radioactive materials that contaminated the soil and groundwater.

The 100-N Reactor differed from the other eight reactors since it had the dual purpose of producing electricity and special nuclear material. The process of using the heat for electricity generation required the reactor coolant system to be re-circulating rather than single-pass, as was the case for the other eight reactors. This re-circulation process, however, caused the accumulation of much higher concentrations of radionuclides in the reactor coolant system. Therefore, the soil that received any feed-and-bleed discharges from the reactor had a much higher concentration of contaminants.

The 100 Area also includes contaminated structures such as buildings, buried pipelines, buried and exposed disposal cribs, and trenches. There are 420 soil sites and 42 burial grounds for a total of 462 waste sites. These remaining sites require remediation to the clean-up levels specified in the approved regulatory decision documents. These clean-up levels generally require removal of radioactivity to preclude a committed effective dose equivalent from all pathways to less than 15 mrem/year and the removal of hazardous contaminants to residential use clean-up levels.

An "operable unit" at the Hanford Site is a grouping of land disposal or waste sites. The Operable Unit designation forms the basis for the regulatory pathway. For the 100 Area, the “source” contamination is grouped geographically into 14 source operable units, namely the 100-IU-6, 100-BC-1, 100-BC-2, 100-FR-1, 100-FR-2, 100-IU-2, 100-HR-1, 100-HR-2, 100-DR-1, 100-DR-2, 100-KR-1, 100-

KR-2, 100-NR-1, and the 100-NR-1 (Treatment, Storage, and Disposal Sites Remedial Action (RA)). These source operable units contain about 462 waste sites to be remediated, which can be categorized as one of four basic types: contaminated soil, buried structures, debris, or burial grounds. As of March 1, 2001, approximately 2.9 million metric tons of soil has been excavated from the operable units in the 100 Area. It is expected that by October 1, 2002 an additional 650,000 metric tons of soil will be excavated. Current estimates indicate that an additional seven million metric tons of soil will require excavation and disposal in the Environmental Restoration Disposal Facility (ERDF) after October 1, 2002.

There are also five operable units, namely 100-BC-5, 100-KR-4, 100-NR-2, 100-HR-3, and 100-FR-3 that address contaminated groundwater in the 100 Area. However, they are not included as part of the River Corridor contract.

The 300 Area was listed on the NPL on October 4, 1989 as one of four NPL sites at Hanford. The 300 Area is located in the southeastern portion of the Hanford Site along the west bank of the Columbia River and about eight miles to the north of the City of Richland. The 300 Area was the location of the uranium fuel fabrication facilities and provided fuel for the Hanford Site's nine plutonium production reactors located in the 100 Area. The 300 Area was also the center for most of the Hanford Site's research and development activities. In connection with these activities, chemical process laboratories, test reactors, and numerous ancillary/support structures were constructed. Some of the 300 Area laboratories and support facilities are still in use. The 300 Area includes three operable units (300-FF-1 and 300-FF-2 are contaminated waste source sites; 300-FF-5 represents contaminated groundwater and is not included as part of the River Corridor contract). They contain 102 soil sites and seven burial grounds for a total of 109 waste sites to be remediated. For more information on the 300 Area including detailed descriptions of the facilities and waste sites, see the Hanford Site 300 Area Accelerated Closure Project (ACP) Plan, HNF-6465, Rev. 0.

The 100 Area and 300 Area are currently broken out by "Zones" per the Work Breakdown Structure (WBS). Maps on pages 5 and 6 identify zone locations for both Areas. See Figure 2.1 for a map of the 100 Area and See Figure 2.2 for a map of the 300 Area

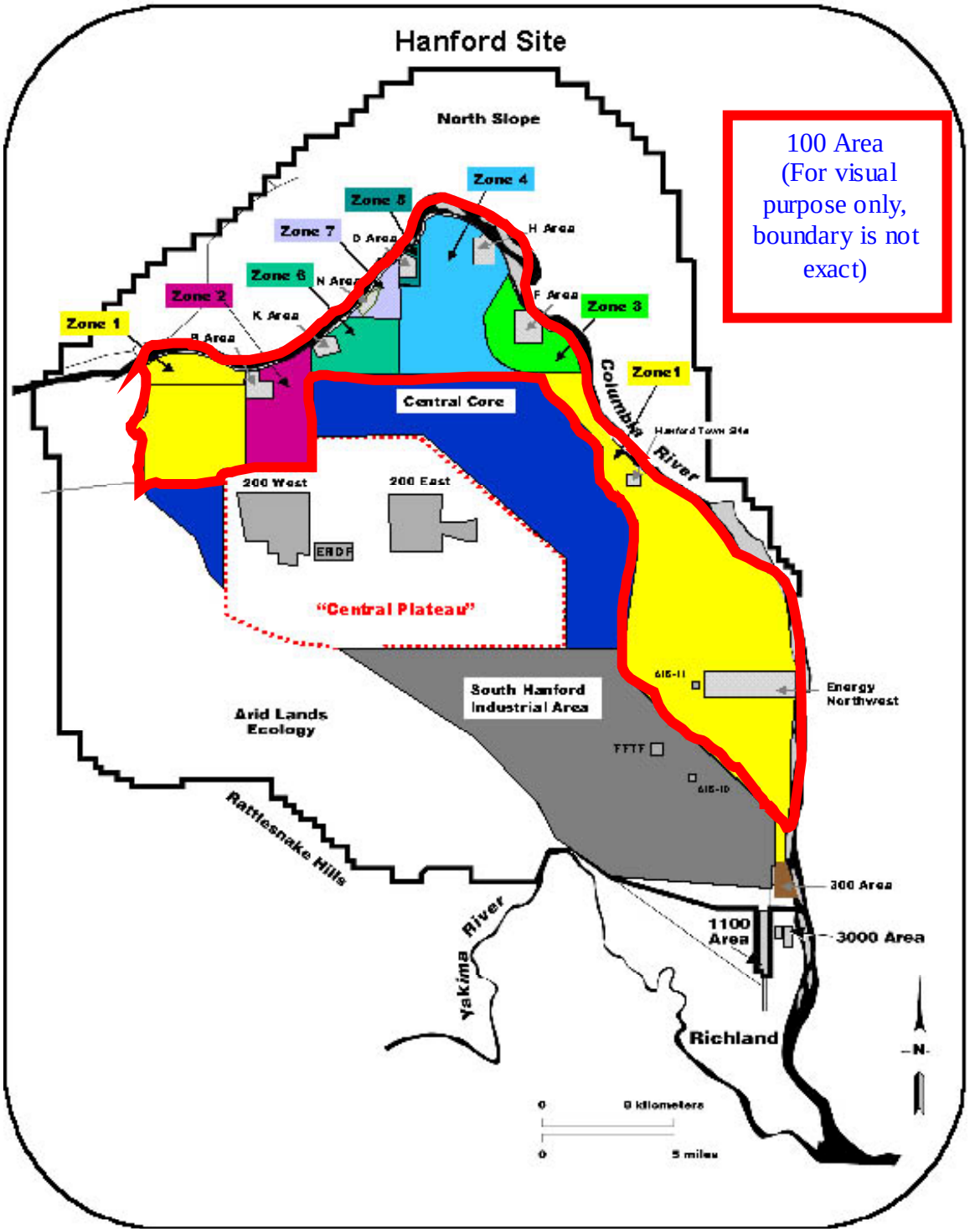


Figure 2.1: Area and Zone Map of 100 Area

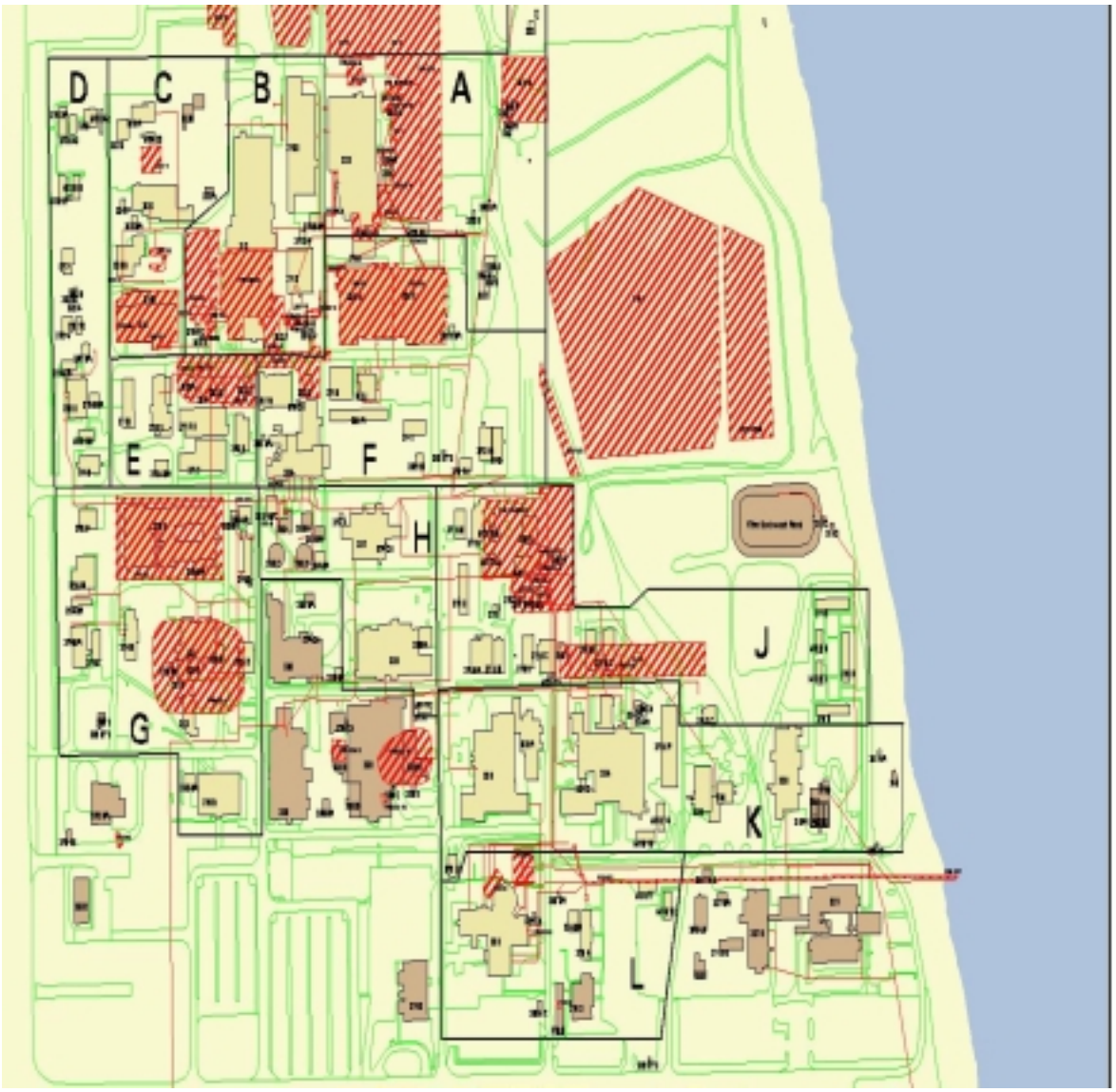


Figure 2.2: Zone Map of 300 Area

3. SCOPE AND PURPOSE

The purpose of preparing the RCC Independent Base is to provide a defensible independent cost estimate for use in considering offers from prospective bidders. The task has been performed in accordance with the guidelines set forth in the *DOE/RL, Hanford Estimating and Scheduling Guide* and includes the following major steps:

- Evaluate the existing documentation supporting the RCC contract work scope
- Prepare an independent base cost estimate
- Prepare an independent project schedule
- Assist in placing the RCC Independent Base Estimate and Schedule on the DOE/RL web site

The RCC Team collected and reviewed existing cost and schedule data that was used as the basis for the RCC Independent Base Cost Estimate. A method was developed to grade the collected data and make adjustments that resulted in a "fair and reasonable" independent cost at the site/facility level. A risk based contingency analysis was then performed to finalize the estimate.

The independent schedule was prepared using a commercially available personal computer based project planning software (Primavera P3™). Activities were established at the lowest practical level of detail and were cost and resource loaded. Activities were logic linked. The schedule identified key milestones associated with the RCC. The RCC Team was directed to take a phased approach in finalizing the schedule that identified funding constraints for the Phase I and Phase II scenarios of the RCC contract. Schedules were analyzed using the resource-loaded activities. Finally, the RCC Team aided in posting the base cost and schedule information on the DOE web site.

4. RCC TEAM BASE COST ESTIMATE AND SCHEDULE DEVELOPMENT

4.1 GENERAL

The overall methodology adopted for developing the RCC Base Cost Estimate is depicted in Figure 4.1. Generally, existing cost data developed by the site contractors has been used as the starting point for developing the independent cost estimate. This cost data is normalized or standardized by removing any overhead adders that had been applied by the contractor to subcontractor and material and other costs. Information on projects outside the scope of the RCC contract is excluded from the estimate. Labor hours are multiplied by newly calculated RCC labor rates. The summation of the new labor cost, and the

subcontractor and material and other costs represents the direct cost to the RCC contractor.

The resultant cost for each type of facility is then analyzed and adjustments made to the cost estimate to arrive at a “Direct Cost to RCC Contractor”. The RCC contractor estimated general and administrative (G&A), direct distributable, and overhead costs are applied to these costs to generate the “RCC Team Base Cost Estimate excluding Contingency”. The “RCC Team Base Cost Estimate excluding Contingency” is analyzed for potential uncertainties to determine the contingency. The sum of the “RCC Team Base Cost Estimate Excluding Contingency,”, plus contingency, and the expected contractor fee results in the Total RCC Team Base Cost Estimate.

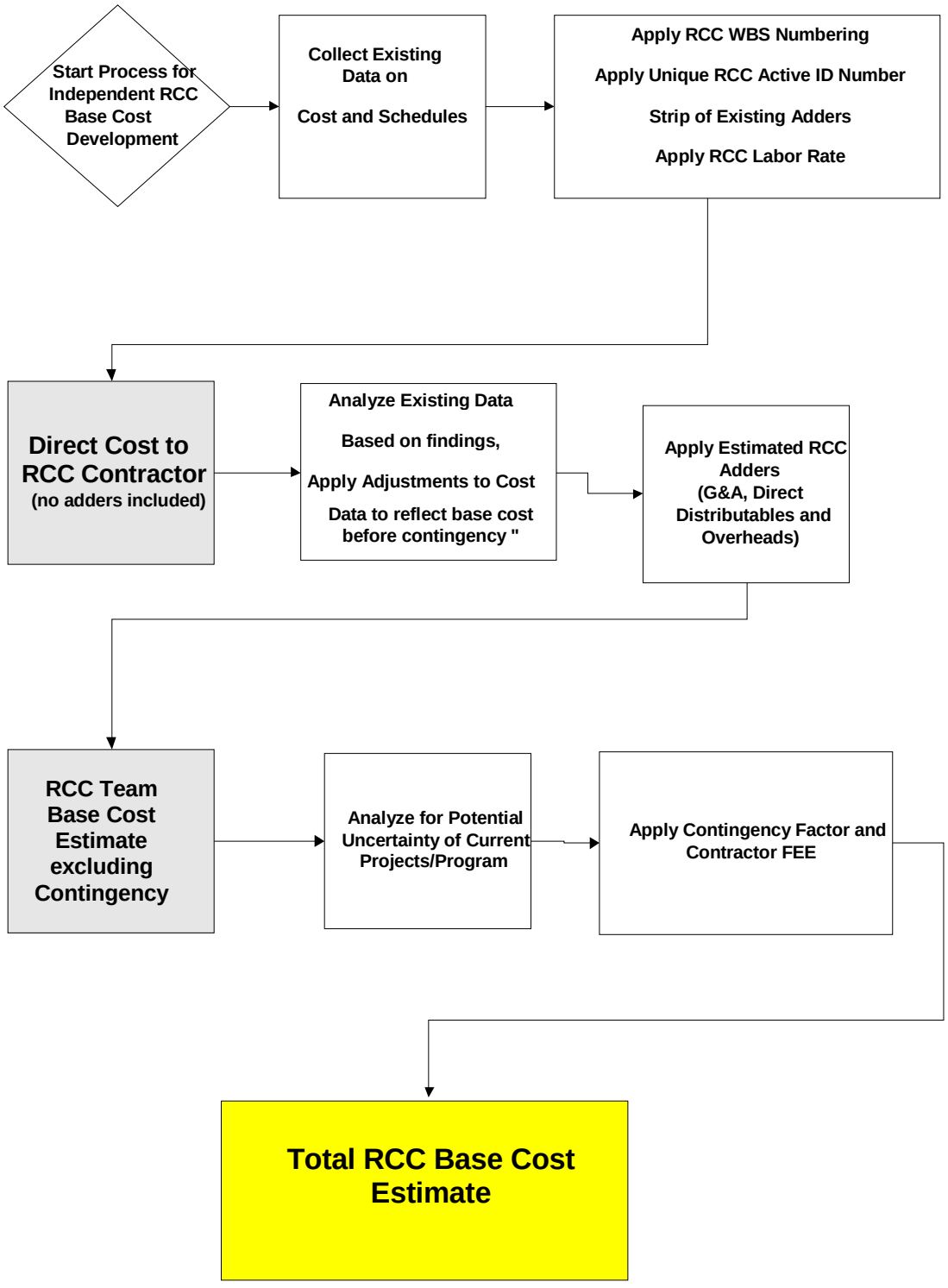


Figure 4.1: Base Cost Development Overall Process

4.2 INITIAL COST DATA AND ADDERS

4.2.1 Data Gathering/Database Development

The data utilized to formulate the RCC Independent Base Cost Estimate and Schedule is derived from information provided and generated from multiple sources, each of which has unique overhead and other rates applied. The Richland Environmental Restoration Baseline prepared by Bechtel Hanford Inc. (BHI), supplied cost information for Project Baseline Summary (PBS) RC01, RC02, RC04, and RC05. The Fluor Hanford (FH) database, developed with the aid of a personal computer based parametric deactivation cost program named POWERtool, has cost information for RC03 and RC06. The 300 ACP schedule further modifies any of the above cost data that is included in the schedule. And finally, cost data for certain projects, such as the 100 Area underground piping, were unavailable or required extensive modification and thus was generated separately by the RCC Team.

Figures 4.2, 4.3, and 4.4 provide further detail of the baseline process for conversion of each of the different data sources information (BHI, FH, 300 ACP, Other) to the "Direct Cost to RCC Contractor." Figure 4.5 graphically shows the steps in arriving at the "RCC Base Cost Estimate" from the "Direct Cost to RCC Contractor." The steps in the Figures are cross-referenced to actual cost information presented in the Appendix A, Labor Rates, Adjustments and Adders to assist the reader in gaining an understanding of the process used. The RCC Independent Base database fields are also included in the appendix.

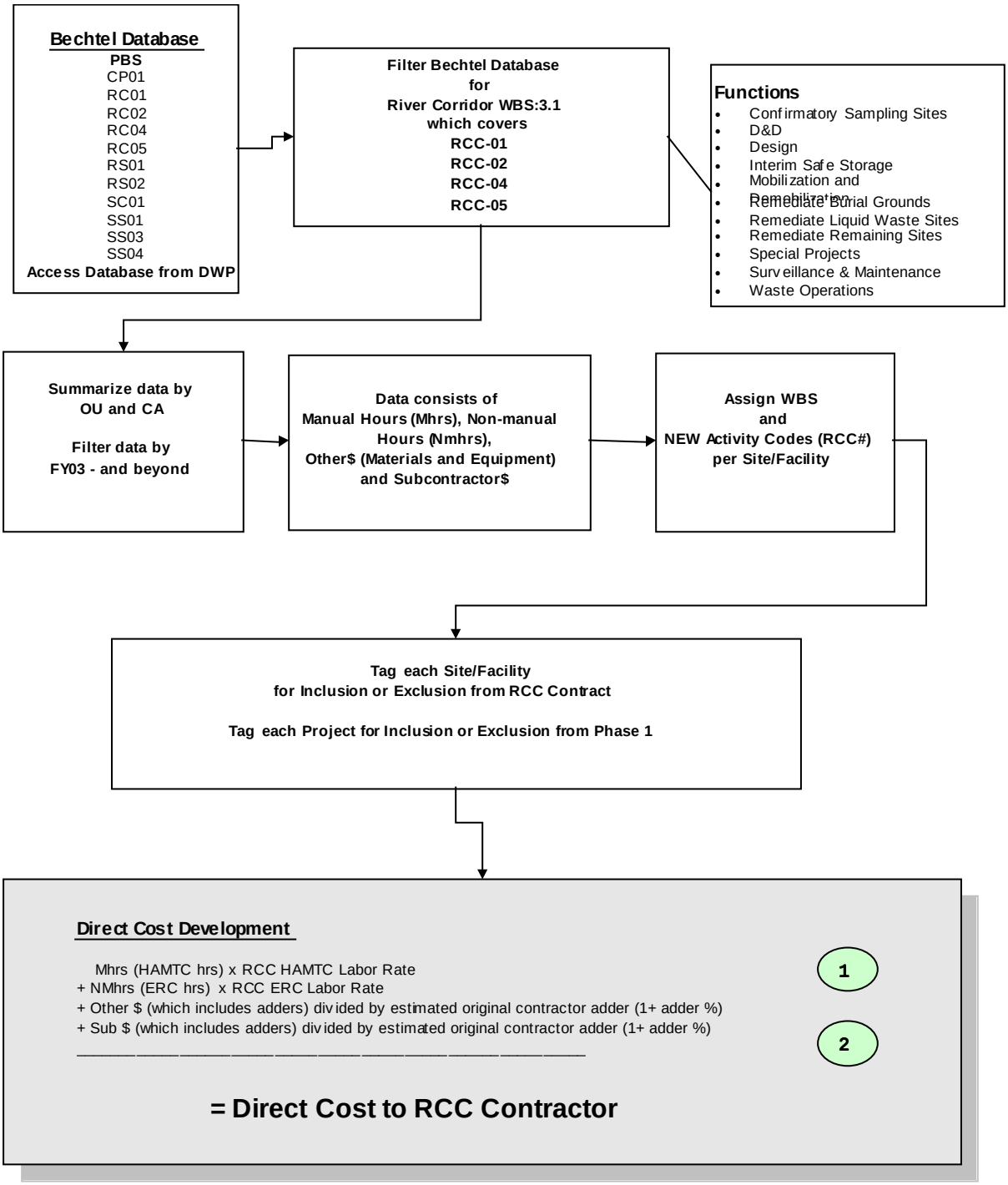


Figure 4.2: Detailed Work Plan Data Flow Diagram

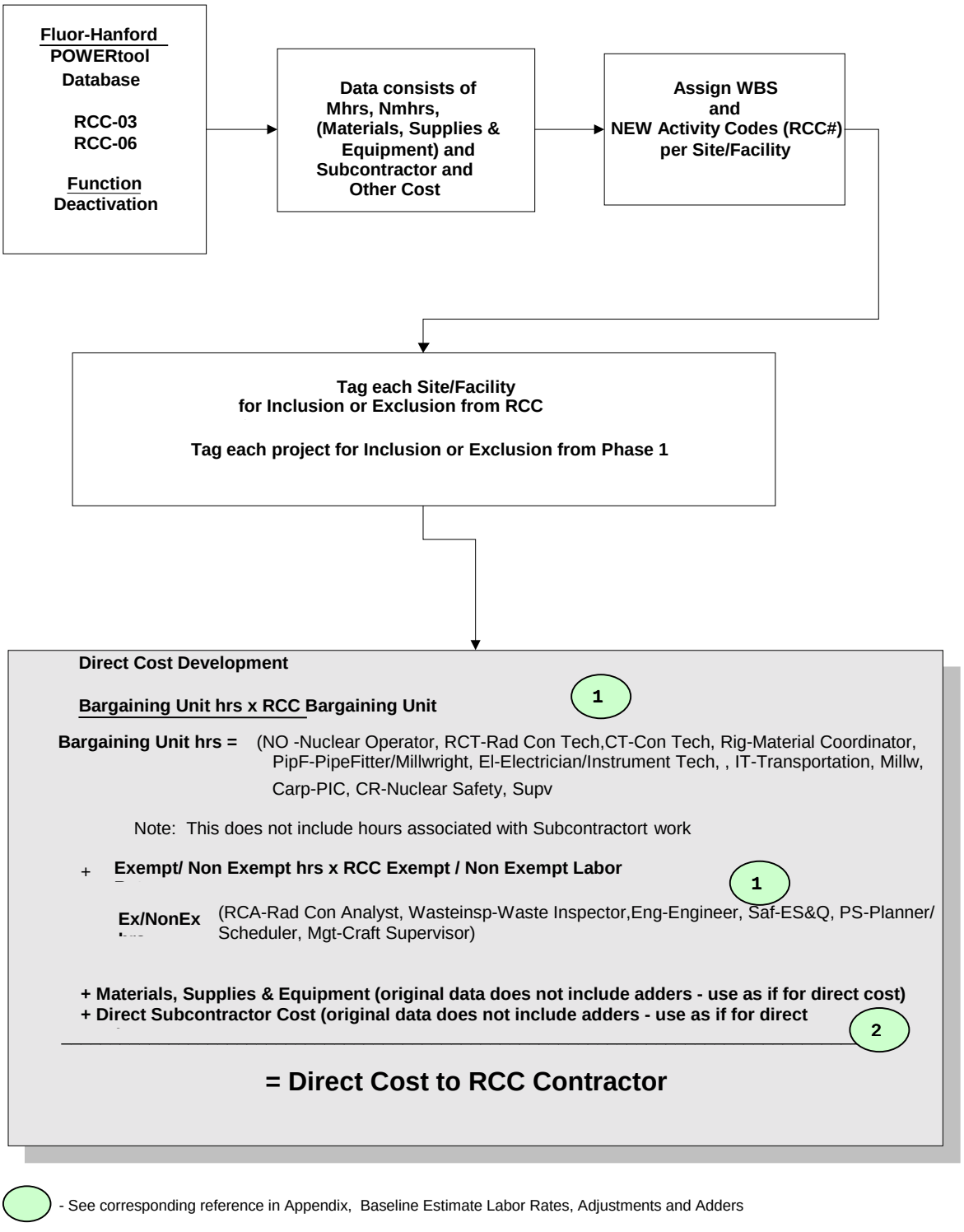


Figure 4.3: Deactivation Projects Data Flow Diagram

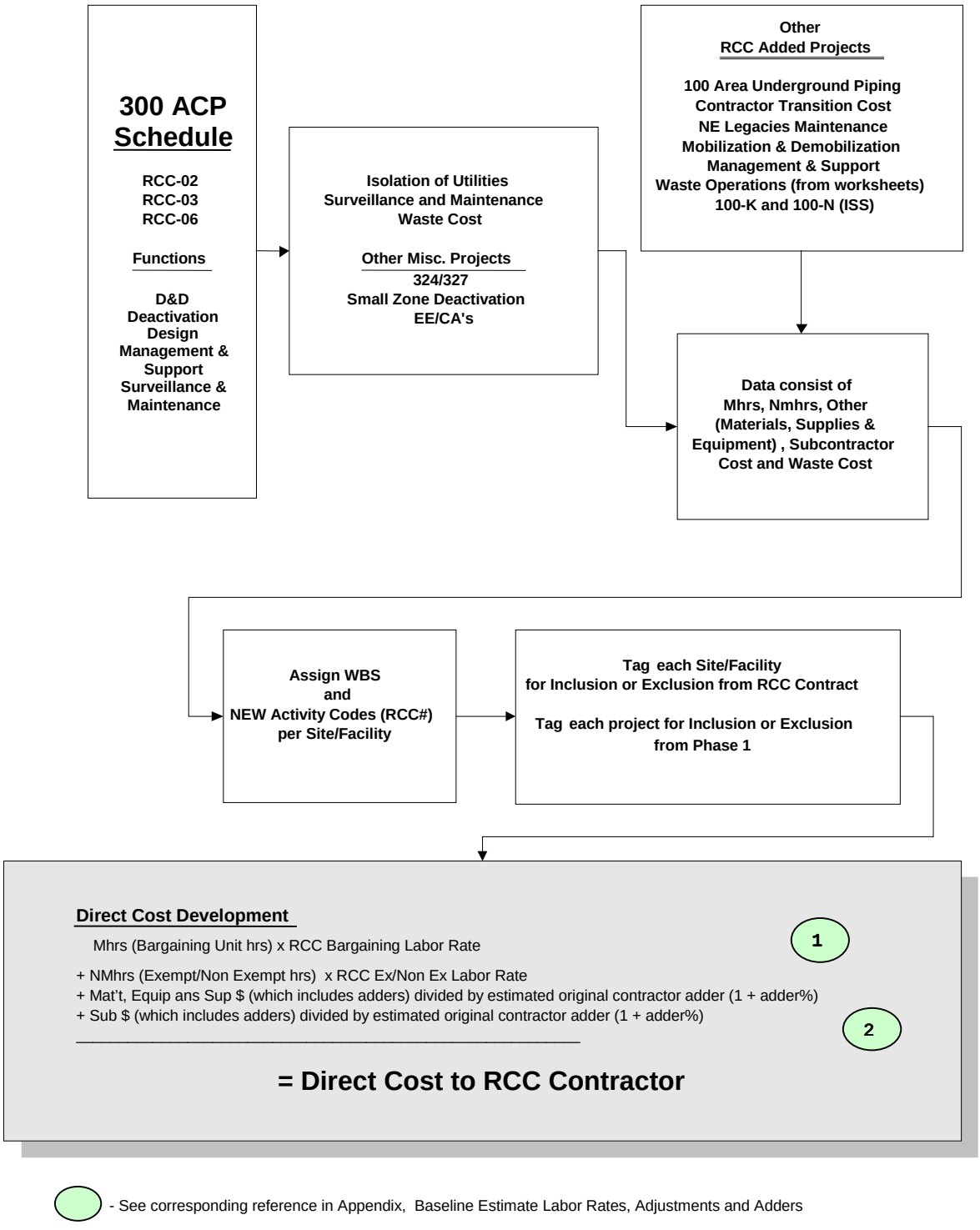


Figure 4.4: 300 ACP and Other Data Flow Diagram

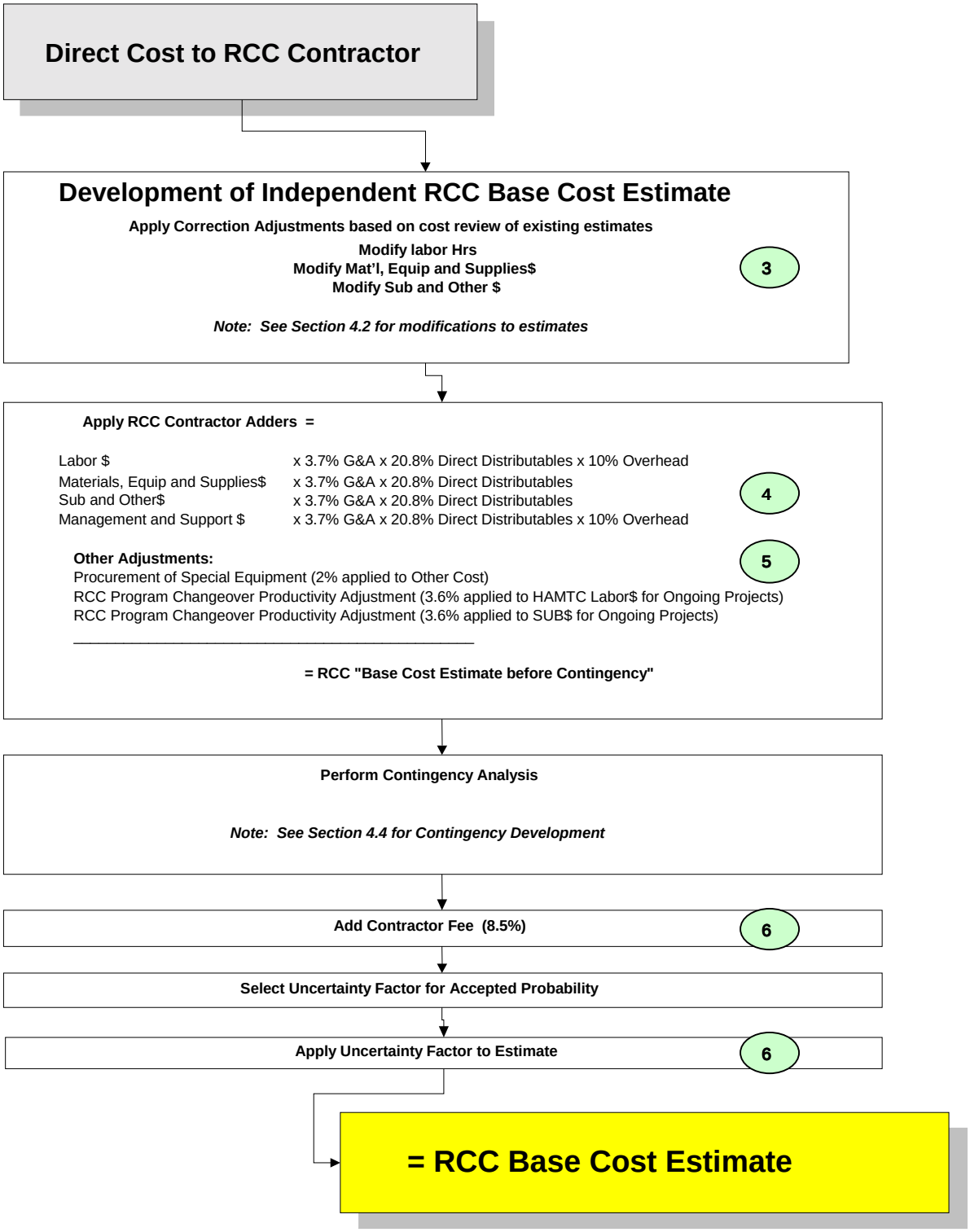


Figure 4.5: Adjustments, Adders, and Uncertainties

4.2.2 Project Management and Support (PM&S)

The overall Project Management and Support (PM&S) costs include the resources necessary to initiate and maintain systems to ensure the quality of these activities and deliverables; promote an injury free workplace; ensure compliance with applicable laws and regulations; perform cost and schedule control in accordance with DOE policy and requirements; and identify and demonstrate program control, business management, and detailed cost estimating support. The PM&S baseline costs comprise the level of support needed to complete the RCC contract.

The PM&S costs for the RCC are based on Hanford historical data and the PM&S structure and overall scope found in the Richland Environmental Restoration Project Fiscal Year 2001 – 2003 Detailed Work Plan. The independent base PM&S costs are applied as a fixed percentage over the period of the contract.

In the team's review of the Richland Environmental Restoration Project Baseline MYWP, it was found that BHI distributed PM&S costs evenly across the six PBS areas. The RCC Team chose to develop the PM&S costs based on the quantity and cost of activities performed in each PBS, and distribute costs based on the percentage of work per PBS of the total River Corridor Restoration costs. This distribution of the PM&S costs should provide the DOE with a better understanding of the effort needed for each area in the River Corridor Restoration project.

The PM&S structure is divided into the following four distinct functions:

A. Project Technical Support
B. Program and Project Support
C. Planning and Controls
D. Compliance, Quality, Safety and Health (CQS&H)

For each of these functions, it is assumed that specific workgroups will be developed to support or maintain the mission goals for each function. The scope of each function includes the following activities:

A. Project Technical Support:

- Design Functions
- Work Plan Procedure Preparation
- Regulatory Support
- Risk Assessment
- Sample and Data Management

B. Program and Project Support:

- Record and Document Control
- Procurement Activities
- Community (External) Affairs or Public Outreach

C. Planning and Controls:

- Strategic Planning
- Performance Analysis
- Progress Tracking
- Change Control Coordination

D. Compliance, Quality, Safety and Health

- Safety and Health Oversight
- Radiation Protection Program
- Industrial Hygiene and Safety
- Fire Protection
- Workers Compensation and Injury Case Management

4.3 RCC BASE COST ESTIMATE ADJUSTMENTS

4.3.1 General Approach

The RCC Team was challenged with analyzing more than 1,100 cost estimates in the RCC contractor's scope of work. Estimate types ranged from no estimate to simple spreadsheets to parametric models to detailed definitive estimates. The analysis method needed to be simple and automated in order to handle the large number of estimates. The team chose to divide the estimates into "model types," make specific adjustments as deemed appropriate; develop any missing estimates; and grade the model types on the three most relevant criteria: scope definition, quantities development methods, and cost estimate pricing.

Specific adjustments were made to certain labor categories and/or other costs. For example, engineering hours were reduced in several D&D model types. Potential ranges were established for each of the three criterion for each model type. The three criteria were weighted for relative importance based on potential effect to the estimates. A simulation for each model type then resulted in additional adjustments to the base facility estimates

The results of the specific adjustments and the adjustments resulting from the simulations are summarized in Appendix A, Estimate Labor Rates, Adjustments, and Adders. The grading ranges are summarized in Appendix B, Estimate and Uncertainty Ranges.

It is important to note that the initial analyses and revisions were performed strictly on the model types and subsequently applied to the individual estimates. Contingency and risk variables (external) were considered in a separate analysis. The base estimate development approach is depicted in Figure 4.5.

4.3.2 Specific Estimate Adjustments

During the review of all the available cost information made available to the RCC Team, it became evident that some of the estimates reviewed would require some updating and that cost estimates were not available for certain facilities or activities. The RCC Team generated new cost estimates or made adjustments to the following:

MCACES Models Estimate Adjustments

The RCC Team reviewed in detail a total of 30 Micro-Computer Aided Cost Estimating System (MCACES) estimate models. These are parametric cost model estimates with specific input parameters. The models were divided into two main groups: remedial action (RA) and decontamination and decommissioning (D&D).

Specific adjustments were made to all estimates associated with certain individual models. These changes are grouped into three categories as follows:

1) RA
2) D&D
3) 300 Area Burial Grounds

The RA models include a 12-day allowance for mobilization in an algorithm used to calculate the Environmental Restoration Contractor (ERC) hours for project management. This results in excessive “Exempt / Non-Exempt” time for small jobs with field durations of one to two days. The “Exempt / Non-Exempt” man-hours were reduced by 144 hours to correct for this. This adjustment results in a more accurate representation of small projects while having negligible effect on larger jobs.

In most D&D models, project management during assessment was found to be double counted in work breakdown structure (WBS) elements 17.01 (Pre-decommissioning) and 91.10 (Project Management Support, Assessment).

Conversely, D&D activity productivity rates were considered aggressive. DOE project managers said that they had not tracked actual hours to that level of detail. However, they indicated that the D&D estimated costs as a whole have generally been accurate. As a result, the RCC Team adjusted the D&D models to level the manual versus non-manual labor hours to reflect anticipated actual performance. Specifically, the team reduced "Exempt / Non-Exempt" man-hours and increased "Bargaining Unit" man-hours as indicated in Table 4.1. Adjustments varied per model type.

All 300 Area burial ground estimates were increased by 168%. These modifications were the result of two meetings attended by RCC Team members. One meeting was with contractor personnel and one with DOE project managers. Recent experience in the 300 Area strongly indicates that the 300 Area Burial Ground model does not sufficiently cover actual scope. The RCC team developed the percentage increase by looking at the probability and cost impact of four potential events:

- More buried waste encountered
- More contaminated waste encountered
- More drummed liquids encountered that require treatment for ERDF disposal
- Liquids encountered that are untreatable or treatable by incineration only

300 Area Burial Ground Risks

Modify Estimate	Probability	Cost Impact	Total Impact
Encounter more buried waste	75.0%	25.0%	18.8%
Encounter more contaminated soil (plume chase)	50.0%	25.0%	12.5%
Encounter unknown drummed liquids (ERDF)	75.0%	50.0%	37.5%
Encounter incineration liquids	50.0%	200.0%	100.0%
			168.8%

Table 4.1 summarizes adjustments made to MCACES estimates by model type.

Table 4.1: Specific Adjustments to MCACES Estimates

Model Description	"Exempt / Non-exempt" hrs	"Bargaining Unit" hrs	Sub/Other $
Below Grade Structure	(144)	no change	no change
100 Area Burial Ground	no change	no change	no change
300 Area Burial Ground	Increase 168%	Increase 168%	Increase 168%
Crib/French Drain	(144)	no change	no change
Piping Remediation	(144)	no change	no change
Retention Basin	(144)	no change	no change
Trench	(144)	no change	no change
Site Closure	no change	no change	no change
300 Area Clean D&D 1K to 5K GSF	(200)	200	no change
300 Area Clean >5K GSF	(390)	390	no change
300 Area Contaminated 1K to 5K GSF	(90)	90	no change
300 Area Contaminated 5K to 30 K GSF	(320)	320	no change
300 Area Contaminated >30K GSF	no change	no change	no change
100 Area Clean <1K GSF	(180)	180	no change
100 Area Clean 1K to 5K GSF	(490)	490	no change
100 Area Clean >5K	(790)	790	no change
100 Area Contaminated <1K GSF	(115)	115	no change
100 Area Contaminated 1K to 5K GSF	(500)	500	no change
100 Area Contaminated 5K to 30K GSF	(875)	875	no change
100 Area Contaminated >30K GSF	(875)	875	no change
300 Area Stack	no change	no change	no change
100 Area Stack	(350)	350	no change
Water Tunnel	(520)	520	no change
Piping Trestle	no change	no change	no change

Other Infrastructure Zone Estimate Adjustments

The estimates for Infrastructure Zone are in the ACP Plan support data sheets and scope statements are in Volume III of the Plan. The Infrastructure Zone estimates include several distinct projects as well as Surveillance and

Maintenance (S&M) for various facilities. S&M costs had been altered in the ACP schedule to reflect a 2012 end date rather than the 2009 end date assumed in the ACP Plan. The cost and scope information for this change was very limited. The RCC Team used the data provided in the ACP schedule to reflect the 2012 end date.

RA Mobilization/Demobilization Estimate Adjustments

The estimates for mobilization and demobilization were very detailed and included items such as six trailers, septic tanks, utilities, and 30 pieces of equipment. However, multiple mobilizations and demobilizations were included within each zone. The RCC Team reduced the number of RA mobilization and demobilization estimates to one or two each per zone in the 100 Area and two for the 300 Area (one for Phase I and one for Phase II).

ERDF Estimate Adjustments

ERDF operational and other costs vary based on waste volumes received. RA is the major driver, not D&D. Starting with the current baseline ERDF costs and anticipated volumes, the RCC Team adjusted ERDF estimated costs to include waste quantities for the miscellaneous underground piping scope addition.

100 Area Reactor Underground Piping Estimates Adjustments

Estimates for 100 Area reactor underground piping were not provided to the RCC Team. The RCC Team developed high-level parametric estimates for the six reactor areas that require miscellaneous underground piping removal based on information contained in the pipeline evaluation reports for the 100-D/DR and 100-B/C Areas. These reports include historical information as well as estimated remaining pipe quantities by various sizes.

Other Specific Adjustments

Certain additional discrete adjustments were made to the baseline estimates based on expected costs that would occur for the RCC contractor. These costs result from the potential for productivity loss issues associated with the new contractor changeover and capital outlay for additional specialized equipment needed for the accelerated work plan execution.

1. Workforce Productivity during Contractor Changeover

When the contract is awarded, there will be a changeover period and learning curve for the new contractor. Work currently underway and planned during the near term should continue, but there is potential for productivity loss due to the changeover that may have an impact on the ongoing projects. The impact is

expected to be minimized by requiring the management team to be on-site three months prior to the changeover of the operation.

It is assumed that there may be some productivity loss for the first three months of the contract. This results in an adjustment equal to 0.5% of the total "Bargaining Unit" hours and subcontractor dollars distributed to the ongoing projects.

2. Availability of Specialized Equipment

Per conversations with BHI and DOE personnel, specialized equipment needed for D&D and RA activities includes hydraulic grapples, concrete crushers, and remotely operated excavation machines (BROC). These machines and attachments are difficult to obtain, cannot be rented, and only a limited number of such pieces of equipment are on-site. It is assumed that an additional $300,000 per year will be required for the accelerated cleanup. This accounts for one major equipment acquisition per year. The cost is distributed to all projects.

4.3.3 Development of Estimate Ranges

As part of the review of the cost estimates, the RCC Team graded all the model types on the three most relevant criteria: scope definition, quantities development methods, and cost estimate pricing. The results of the grading define the range of costs expected for a particular cost estimate based upon the review of the methodology employed for generating the estimate and quality of the information available. The grading ranges are summarized in Appendix B, Estimate and Uncertainty Ranges.

Based on engineer's judgment the three criteria were weighted for relative importance based on potential effect to the estimates as follows:

Scope	35%
Quantity	40%
Pricing	25%

The weights are based on scope and quantity issues having potentially greater effect on the estimates than pricing. If scope and quantities are not well defined, pricing becomes essentially irrelevant. On the other hand, if scope and quantities are defined satisfactorily, pricing will be high on some items and low on others, resulting in a leveling effect.

In developing the potential cost impact due to scope definition, the RCC Team considered the clarity of work descriptions and the technical approach, e.g., are the assumptions clear and sufficient to define the work to be performed and are

qualifications and exclusions stated? The potential for unknown elements (changes in contamination volumes) within the scope of the RCC contract was also considered

In determining the cost impact due to quantity, the RCC Team considered the approach utilized for quantifying key project elements and other major cost drivers such as waste volumes, e.g., are quantities based on characterization and resulting engineering takeoffs, walk downs, or assumptions with minimal available information?

For grading the cost estimate pricing, the RCC Team considered the bases of unit pricing such as allowances, engineer's judgment, historical cost, bottoms-up unit pricing, and subcontractor quotations. The costing techniques employed for any activity based estimating were also considered, e.g., are unit prices consistent with industry and/or site standards (whichever is appropriate) and are estimated productivity rates for the work being performed conservative or aggressive?

POWERtool Estimates Ranges

Fluor Hanford (FH) personnel indicated that each facility was evaluated by visual inspection and the estimate scope and quantities were developed from the information gathered. Walk downs were performed on 100% of all facilities to determine deactivation activity requirements and quantities. Areas for the facilities were calculated based on facility footprint multiplied by number of stories. It was stated in meetings that all quantity assumptions were very conservative. However, the inspections were visual versus actual characterizations and as a result the quantity variability could still be high.

The scope range was based on the potential for encountering more or less equipment and hazardous waste during deactivation operations, and the cost consequence of such occurrence. Scope consequences are expected to vary per facility type and confidence ranges were assigned accordingly.

The POWERtool estimating system contains a library of user-defined activities and resources for specific deactivation tasks. A team of ten members that included estimators, engineers, and field labor representatives developed productivity rates for activities included in the system. The rates are considered moderate. Pricing for the work was developed conservatively to insure items were covered. The RCC Team confirmed that the estimate was conservative by reviewing 100% of the deactivation activity library unit pricing. Based on the review, facility deactivation estimates were categorized into the following groups to apply a pricing confidence level:

1) Office Buildings
2) Storage Buildings
3) Mobile Offices
4) Support Facilities
5) Laboratory Facilities
6) Deactivation

Office building, storage building, and mobile office estimate pricing was found to be conservative. This conservative grading is based on the following:

- Minimal work is required compared to other structure types.
- The primary cost is for characterization and should be less for these facilities since office buildings and storage facilities are generally constructed as one large consistent area.
- Areas of the storage buildings and trailers are small, usually less than 2,000 square feet and uncluttered. Consequently work should progress quicker than parametrically estimated.

Support facilities were evaluated based on the activities included in the estimate, the type of support it provided, and the type of facility it was supporting. Assigned ranges varied based on these factors.

Laboratories and the buildings with known hazardous and radioactive materials were assigned ranges based on the following:

- Hazardous and radioactive materials add uncertainty, potentially driving the deactivation cost higher.
- Laboratories tend to be more cluttered with piping and equipment not found in other buildings. This could reduce estimated productivities significantly.

Several additional deactivation projects in the 300 Area were identified as risky: 313, 3720, 308, and 333. These projects were grouped into a separate model and given ranges and confidence scores similar to the 324 and 327 facilities.

Appendix B, Estimate and Uncertainty Ranges, summarizes the RCC Team grading for each POWERtool estimate model type and category. They are identified under Column ID as 1P for the categories noted above.

MCACES Models Estimate Ranges

MCACES model types were categorized into various site types as shown in Appendix B, Estimate and Uncertainty Ranges, and identified as 2M. The RA and D&D models and associated estimates were graded for scope and quantity

uncertainties based on information obtained during meetings with contractor and DOE project managers. The RCC Team calculated ranges of values based on the probability of potential occurrences and the resultant cost impact. Items considered for scope and quantity impacts include:

- Model completeness and level of optimism
- Potential to encounter unanticipated or unknown liquids
- Potential to encounter more waste or contaminated soil
- Potential to encounter more hazardous waste

Each of the 30 MCACES parametric cost models was reviewed and graded on an individual basis. They were generally graded as budget type cost estimates from a pricing standpoint. The D&D models were found to be more conservative, especially in the project management (non-manual hours) assumptions.

Composite MCACES estimates that are combinations of the basic MCACES estimate models were also reviewed. They are used by the site in the development of estimates for areas that have multiple scope items. The composite models were adjusted and graded using a weighted average based on the basic MCACES models used in the composite.

Appendix B, Estimate and Uncertainty Ranges, summarizes the RCC Team grading for each MCACES models estimate type and category. They are identified under Column ID as 2M.

Building Utilities Isolation Estimate Ranges

The estimates for individual facility utility isolation are in the ACP Plan support data, Volume III. These parametric estimates, including input data, are documented for each utility isolation type (Sanitary Water, Electrical, Process and Sanitary Sewer, Steam and Natural Gas Line, and Telecommunication).

The RCC Team categorized the facility utility isolation estimates into the following groups for determining scope, quantity, and pricing confidence levels:

1) Storage/Small
2) Laboratory/Large
3) Other

Quantities for each 300 Area facility are documented in matrix form by utility isolation type in the ACP Plan. These quantities were developed from a combination of walk downs, drawing searches, and other means available such as confirmation from knowledgeable sources. This method of data gathering was confirmed through discussions with personnel responsible for the process. The

RCC team deduced that the quantity information was reasonably accurate with minimal chance for variance.

Scope for each 300 Area facility is documented in the parametric estimate for each utility isolation type. The RCC team reviewed the potential for scope changes for various type facilities and developed confidence grading accordingly. For facilities grouped into "Storage/Small" facilities, such as trailers, storage, and various other small buildings, the potential for scope change was determined to be minimal and the stated scope assumptions were viewed as very conservative. Utility outlets would be visible and more easily accessible on the small facilities than parametrically estimated. However, the team rated "Laboratory/Large" facilities as having greater potential for increased scope. The laboratories generally included process lines, which increase the potential for a new waste site discovery that could delay timely completion. In addition, the exact location of utility outlets may not be as readily apparent or easily accessible. "Other" facilities are considered to have a minimal potential for reduced or increased scope.

The RCC Team reviewed the parametric estimates for pricing. Each estimate is made up of various activities that include required labor categories and estimated man-hours. Pricing was found to be generally conservative and appropriate for the current level of planning.

Appendix B, Estimate and Uncertainty Ranges, summarizes the RCC Team grading for each facility utilities isolation estimate model type and category. They are identified under Column ID as 3A for the categories noted above.

Other Infrastructure Zone Estimate Ranges

The RCC Team grouped the S&M estimates into one category for grading. The S&M scope is considered well defined based on historical performance and current procedures. In addition, the team does not expect any major changes to the established procedures. Quantity was determined to be the most uncertain area for S&M since the number of facilities requiring S&M in the out years may vary based on schedule slippage or acceleration. Finally, the team agreed that pricing should be well established based on historical performance.

The "distinct projects" in the Infrastructure Zone were graded as one group because of the similarities of available information. The RCC Team noted opportunity for scope change based on various factors such as lack of current design and other unknowns. Quantity statements are present in the narratives and the use of existing drawings for quantity calculations increase the accuracy of this information. Some activity-based unit pricing exists and was found to be

reasonable, but this type of information was limited and does not match the ACP Plan. The pricing information was graded as one step above order-of-magnitude.

Appendix B, Estimate and Uncertainty Ranges, summarizes the RCC Team grading for each S&M estimate and for each distinct project estimate in the Infrastructure Zone by model type and category. They are identified under Column ID as 3A for category "S&M" and "Other Infrastructure" respectively.

Design and Non-Site Specific (NSS) Estimate Ranges

Design and NSS estimates are based on actual cost data, contract awards, and project experience. However, the awards are cost plus contracts that historically have experienced scope and cost growth. In addition, there is a potential for RA work uncovering additional design needs. Thus, the RCC Team graded the group as noted in Appendix B, Estimate and Uncertainty Ranges. They are identified under Column ID as 4O for category "Design."

RA Mobilization/Demobilization Estimate Ranges

The estimates for RA mobilization/demobilization are activity based and very detailed. Scope is well defined and should not vary from anticipated performance. Quantities could vary if equipment was mobilized to another site and then brought back for additional work. The temporary contractor trailers are expected to remain in place at each zone until work is complete. Additionally, trailers are assumed available on-site so that rental is not expected to be an issue. The unit prices are deemed reasonable.

The RCC Team graded the estimates as definitive as noted in Appendix B, Estimate and Uncertainty Ranges. They are identified under Column ID as 4O for category "RA Mobilization."

ERDF Estimate Ranges

The RCC Team expects that the ERDF costs will level out during the RCC contract since maintaining a relatively constant waste volume feed to the ERDF is a scheduling consideration. Scope is viewed as consistent and defined since the facility is operational. The team considered quantity to have the most potential for change because the projected volumes of material to the ERDF are generally parametrically forecasted. Pricing could be an issue because subcontracts are re-negotiated after FY 2003.

The RCC Team graded the estimates as noted in Appendix B, Estimate and Uncertainty Ranges. They are identified under Column ID as 4O for category "ERDF."

324/327 Building Deactivation Project Estimate Ranges

The RCC Team was provided very detailed definitive estimates for deactivation of the 324 and 327 facilities. The estimates were completed January 2000 and incorporate field deactivation experience for the two facilities. However, the deactivation of these two facilities is considered one of the major technical challenges on site. As a result, the team considered changes in scope to be quite likely. In addition, quantities were defined but potentially could change due to the nature of the work. Pricing was reviewed and found to be reasonable.

The RCC Team graded the group as noted in Appendix B, Estimate and Uncertainty Ranges. They are identified under Column ID as 4O for category "Deactivation".

Interim Safe Storage (ISS) Reactor Stabilization Estimate Ranges

The team reviewed a current estimate of a reactor ISS project to establish ranges of expected costs. All ISS projects are ongoing with the exception of KE, KW, and N reactors. The KE and KW reactors present a challenge because they are larger than other reactors on site. The N reactor presents a technical challenge because the facility is designed differently than other reactors on site. Furthermore, a Record of Decision (ROD) that defines the method and end state of the ISS for the N reactor is not yet in place. As a result, ISS projects are split into three groups and given confidence ranges as noted in Appendix, Estimate and Uncertainty Ranges. They are identified under Column ID as 4O for category "ISS."

100 Area Reactor Underground Piping Estimate Adjustments

Estimates for 100 Area reactor underground piping were not provided to the RCC Team. The RCC Team developed high-level parametric estimates for the six reactor areas that require miscellaneous underground piping removal based on information contained in the pipeline evaluation reports for the 100-D/DR and 100-B/C Areas. These estimates were graded as order-of-magnitude estimates. They are identified under Column ID as 4O for category "Remediation" and model type "UGPIPE" in Appendix B, Estimate and Uncertainty Ranges.

4.4 ESTIMATED UNCERTAINTY AND CONTINGENCY ANALYSIS

4.4.1 General

The sum of the individual facility estimates and the other adjustments is defined as the RCC Team's "Base Estimate Before Contingency". A contingency analysis was performed to account for:

- Uncertainties encountered during execution of cleanup activities.
- The impact of external factors on the cost and schedule of the projects

The RCC Team utilized Crystal Ball™, a DOE accepted commercially available personal computer based forecasting and analysis program, to run simulations for developing the final base contingency. The contingency simulation included all individual baseline estimates and the external risk variables. The total base cost was further grouped into three distinct forecast categories to better represent the potential for cost variation based on the quality of the information available for a project and the historical cost experience for similar projects:

1) High-Risk Projects
2) Remaining Projects
3) Risk Variables (External)

The initial low and high limits for each individual facility estimate were calculated by applying the ranges of cost developed for scope, quantity, and pricing during the estimate model analyses. The results represent the most likely range of costs for each facility by the RCC Team. These limits were then modified based on expected degrees of accuracy set forth in the *Office of Infrastructure Acquisition DOE Cost Estimating Guide, Volume 6, November 1994*, and further discussions with cognizant DOE RCC program managers. Appendix B, Estimate Adjustment and Uncertainty Ranges tabulates the initial and extended ranges for each model type.

Projects deemed to be "High-Risk" are represented by a custom extreme value distribution with the following assumptions:

1) An extreme lower limit of 50% below that calculated during the base estimate development
2) A most likely value (mode) as the base estimate
3) A 95% cumulative probability that the upper limit of costs is no greater than twice the highest cost calculated during the base estimate development
4) An extreme upper limit of four times the base estimate

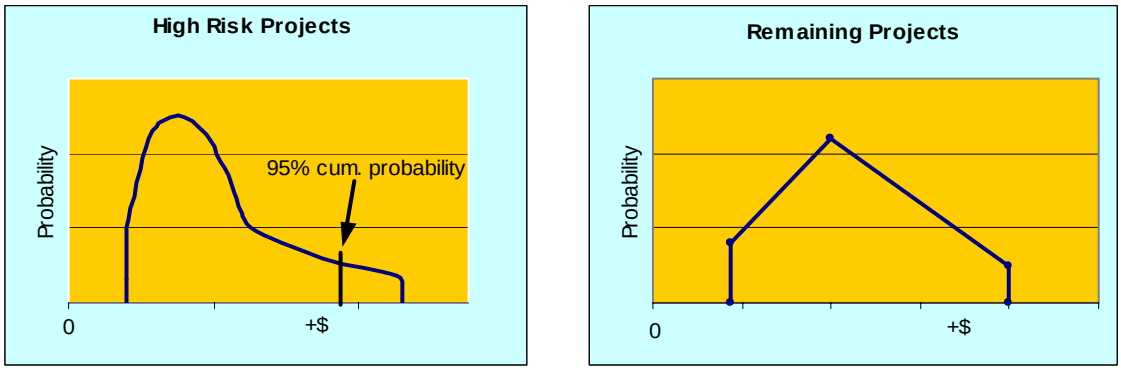
This distribution was chosen because the nature of the work involves many unknowns. As a result, there is a good potential for major cost increases but also some potential for cost savings. High-Risk projects include all underground remediation work (burial grounds, liquid sites, and remaining sites), N and K Area reactors ISS, BEMR listed projects, the 324 and 327 deactivations, and other selected deactivation projects.

The "remaining projects" were represented by a triangular distribution with the following assumptions:

1) An extreme lower limit of 50% below that calculated during the base estimate development
2) A most likely value (mode) as the base estimate
3) An extreme upper limit of 50% above that calculated during the base estimate development

This distribution was chosen because the work in the "remaining projects" is more defined (has less unknowns) and thus results in a higher degree of confidence in the base estimates. Remaining projects included D&D, remaining deactivation, RA mobilization, design, ongoing reactor ISS, utility isolation, S&M, ERDF operations, and PM&S. The High-Risk and remaining project distributions are illustrated in Figure 4.6.

Figure 4.6: Project Distributions



"External risk" variables are also represented by triangular probability distributions. The distributions are defined by using up to four distinct parameters to reflect the potential of occurrence and the expected effect on overall cost. These parameters are the lowest incremental cost possible, the highest incremental cost possible, the current estimated cost (zero incremental cost), and the incremental cost representing an 80% cumulative probability of not

exceeding. Examples of possible resultant distributions are illustrated graphically in Figure 4.7.

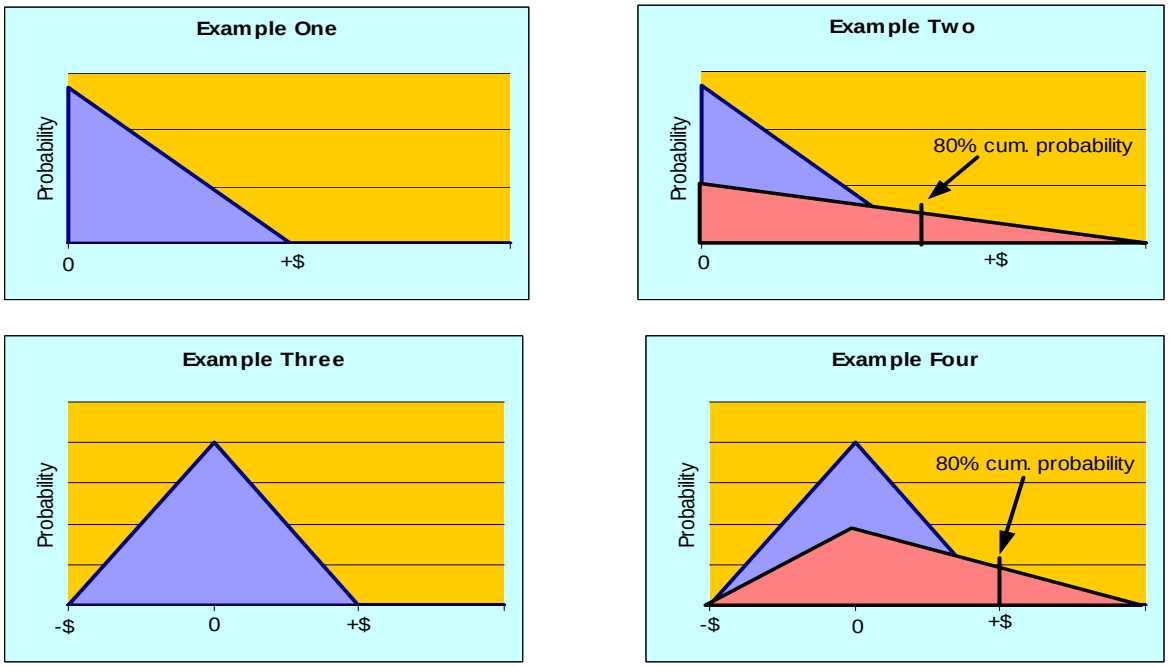


Figure 4.7: Potential External Risk Variable Distributions

4.4.2 Risk Variables (External)

Table 4.2 depicts the risk variables considered by the RCC Team. External items that constituted a change in RCC contractor scope were reviewed, but were not included in the contingency analysis as directed by the DOE. More detailed discussion and analysis assumptions follow.

Table 4.2: Risk Variables (External) Considered

ITEM	DESCRIPTION	COST RISK	SCHEDULE RISK
1	Workforce Productivity during Contractor Changeover	Y	Y
2	Ramp-up of New Workforce	Y	Y
3	Training of New Workforce	Y	Y
4	Strikes	N	N
5	Understanding of Government Requirements	N	N

ITEM	DESCRIPTION	COST RISK	SCHEDULE RISK
6	Availability of Specialized Equipment	Y	Y
7	Weather	Y	Y
8	Approval Turnaround Time	Y	Y
9	Sample Analysis Capacity and Turnaround Time	N	Y
10	Changing Regulations and / or Interpretation of Regulations	**	**
11	Funding	**	**
12	Commodities, Raw Materials, Wage Rates, Site Services	Y	N
13	Procurement Lead Times	N	N
14	Current Non-River Corridor Project Assumptions	**	**
15	Bidding Climate / Contract Market	N	N
16	Intervention by Outside Groups	**	**
17	Labor Bumping	Y	Y
18	Other Problems	Y	N

*** May be a change in contract scope and thus not included in contingency analysis***

1. Workforce Productivity during Contractor Changeover

When the contract is awarded, the new contractor will undergo a change over period and experience a learning curve. It is assumed that the work force and middle management will continue with the new contractor. However, upper management will be replaced and new operating methods and new procedures for conducting business will be written. New subcontracts will be written. Work currently underway and planned during the near term are expected to continue, but there is potential for productivity loss and subsequent impact to the schedule due to the changeover. The contractor changeover and learning curve base adjustments are based on past experience at Hanford as well as other DOE sites, such as Rocky Flats and Oak Ridge.

Changeover Time Analysis and Assumptions

"Bargaining Unit" personnel and Subcontractors are required to work more hours to complete the ongoing work due to lower productivity during changeover.

Lowest incremental cost: No changeover costs incurred ($0).

Incremental cost representing an 80% cumulative probability of not exceeding:
No additional costs incurred above those included in the base estimate cost.

Highest incremental cost:
Assume 50% efficiency for 12 months (6 month loss). This requires an increase of production of 6/112 or 5.4% for the remaining months (applied to "Bargaining Unit" and subcontractor $).

2. Ramp-up of New Workforce

Due to acceleration of the cleanup schedule, the on-site work force will be increased and multiple subcontracts awarded. The acceleration of deactivation work in the 300 Area will require hiring new workers. The new employees will require training, baseline physicals, clearances, and badges.

Based on conversations with "Bargaining Unit", hiring and placement of new workers has not been a problem in the past. However, competition for skilled workers from other large projects on-site (such as the Waste Treatment Plant) pose a potential cost and schedule risk. The potential costs incurred to ramp-up the new work force are combined with the analysis for potential additional training costs below.

3. Training of New Workforce

Based on conversations with the Hazardous Materials Management and Emergency Response (HAMMER) Training and Education Center all new employees are required to complete 4 to 8 weeks of training depending on their job description. Examples of possible required training for non-management personnel include the following:

- Hazardous Waste Operator (HAZWOPER) 40 hrs
- RAD Worker Training 24 hrs
- Hanford General Employee Training (HGET) 3 hrs

- Mask Fit 8 hrs
- Criticality Safety 8 hrs
- As Low As Reasonably Achievable (ALARA) 4 hrs
- Chemical / Nuclear Operator 200 hrs

Historically, the Hanford Site has not had trouble training workers for new projects. However, other planned and ongoing projects such as the Waste Treatment Plant could cause competition and subsequent delays for worker training in certain labor categories. Consequently, the acquisition and training of new workers poses a schedule risk whenever the work is accelerated. The current workforce will continue with the new contract. However, hiring of additional personnel and training may be necessary over the life of the contract.

Ramp-up and Training Analysis and Assumptions

Additional "Bargaining Unit", Subcontractor, and "Exempt / Non-Exempt" labor is required to complete the program in the necessary time frame.

Lowest incremental cost: No additional costs incurred ($0).

Incremental cost representing an 80% cumulative probability of not exceeding:
Assume a 1% increase of costs over the life of the contract (applied to "Bargaining Unit"/subcontractor and "Exempt / Non-Exempt" $).

Highest incremental cost:
Assume a 3% increase of costs over the life of the contract (applied to "Bargaining Unit"/subcontractor and "Exempt / Non-Exempt" $).

4. Strikes

It is expected that the new contractor will sign the site labor agreement with all bargaining units, which prohibits strikes. Hence, this will not be a risk.

5. Understanding Government Requirements versus Best Commercial Practices

It is expected that a contractor with environmental remediation, deactivation, decontamination, decommissioning and demolition of nuclear facility experience will be awarded the contract. The contractor will understand minimum staffing levels for activities and other requirements mandated by DOE Orders. Furthermore, based on lessons learned, it is assumed that Government

requirements will be clearly stated and understood from industry one-on-one sessions. The Draft Request for Proposal (DRFP) and specifications will be clearly written and unambiguous regarding Government requirements. Hence, it is assumed that this factor will not pose a cost or schedule risk.

6. Availability of Specialized Equipment

Specialized equipment is needed for activities such as D&D as per conversations with BHI and DOE. This includes hydraulic grapples, concrete crushers, and remotely operated excavation machines (BROC). These machines and attachments are difficult to obtain and cannot be rented. A limited number of such specialized pieces of equipment are on site.

Specialized Equipment Analysis and Assumptions

Additional capital investments may be required to allow work requiring this equipment to be performed in parallel rather than sequentially to minimize adversely impacting the schedule.

Lowest incremental cost: No additional specialized equipment required ($0)

.

Incremental cost representing an 80% cumulative probability of not exceeding:

No additional costs incurred above those included in the base estimate cost.

Highest incremental cost:

An additional $1 million per year will be required. This accounts for more than one major equipment acquisition per year.

7. Weather

Weather refers to extreme conditions such as hot, cold, or high winds that could impact work performance. A contractor may be liable for paying workers a full day's pay even though they have been sent home early due to inclement weather. On the other hand, bad weather is not expected to affect all types of work activities since deactivation could proceed indoors during inclement weather. It is assumed that bidding contractors will include the impact of "normal" periods of poor weather in their bids as is currently assumed in the base estimate. However, there is a potential for encountering weather conditions that are worse than normal.

Weather Analysis and Assumptions

"Bargaining Unit", Subcontractor, and "Exempt / Non-Exempt" labor will be affected by weather.

Lowest incremental cost: No additional cost ($0).

Incremental cost representing an 80% cumulative probability of not exceeding:
Labor costs will be incurred for 15 days per year attributed to work stoppage and down time due to weather conditions. Such an event will occur three out of ten years. This results in an impact of 15 days/yr x 3 years = 45 days over the 2640 total work days available or 1.7% applied to "Bargaining Unit", subcontractor and "Exempt / Non-Exempt" costs.

Highest incremental cost:
Labor costs will be incurred for 15 days per year attributed to work stoppage and down time due to weather conditions. Such an event will occur six out of ten years. This results in an impact of 15 days/yr x 6 years = 90 days over the 2640 total work days available or 3.4% applied to "Bargaining Unit", subcontractor and "Exempt / Non-Exempt" costs.

8. Approval Turnaround Time

Obtaining signatures and approval of documents by Tri-Party Agreement members (EPA, Ecology, and DOE) could pose a schedule risk for some projects. This may be particularly acute for site verification and closeout documents. This risk is synonymous with verification sampling in that the lag time awaiting project closeout could increase. Note that in many cases, the contractor will still be able to mobilize onto a new project while waiting for final approval. The same is true for D&D and deactivation work plans. It is assumed the contractor can proceed with other tasks while waiting for initial procedures to be approved. However, all things considered, this issue could affect the scheduled completion of the project.

Approval Analysis and Assumptions

"Exempt / Non-Exempt" labor will be affected by delays in approvals.

Lowest incremental cost: No additional cost ($0).

Incremental cost representing an 80% cumulative probability of not exceeding:
Not constrained, Allows the Risk Analysis distribution curve to determine 80% cumulative probability cost.

Highest incremental cost:
One month (22 days) will be lost per year. This results in an impact of 22 days/yr x 10 years = 220 days lost over the 2640 total work days available or 8.3% applied to "Exempt / Non-Exempt" labor cost.

9. Sample Analysis Capacity and Turnaround Time

Accelerated cleanup will place additional demands on sample analysis requirements due to increased observational approach and cleanup verification sampling. These sample requirements will compete with other ongoing site projects and could impact turnaround time. Also, the contractor will be dependent on independent third parties for quality control sample analyses, which could be delayed due to other demands. To offset these potential impacts, the contractor could contract with mobile or offsite lab services. Furthermore, if turnaround time for cleanup verification and closeout samples become excessive, it is assumed the contractor will mobilize onto different projects during the interim period, thus minimizing downtime.

10. Changing Regulations and / or Interpretation of Regulations

Environmental regulations could change during the course of the contract. This is assumed to be a change in scope if it occurs. Additionally, it is assumed that stakeholder caused changes to schedule or performance would also constitute a change of scope.

11. Funding

It is assumed funding will be provided to meet the closure schedule. If funding requirements are not met, this may constitute a change in scope.

12. Commodities, Raw Materials, Wage Rates, Site Services

This item includes concrete, steel, cost of utilities, fuel and other resources including site services and direct distributables. The majority of the work included in the RCC contract is cleanup and "deconstruction", as opposed to new construction, so the impact would be minimal if prices for materials increase. However, fuel price increases will affect operating expenses and the cost of other

materials that require petroleum for manufacturing (such as plastics and liners). Contractor wage rate increases often out pace assumed site operating escalation rates. The stability of utilities and energy prices are less certain due to the extended duration of the contract. Although site services generally tend to be stable, a potential for variance exists over the life of the contract.

Materials Analysis

All costs may increase or decrease based on the inflation rate applied for the duration of the contract.

Lowest incremental cost:
Assume a decrease of 1% (applied to all costs).

Incremental cost representing an 80% cumulative probability of not exceeding:
Not constrained, Allows the Risk Analysis distribution curve to determine 80% cumulative probability cost

Highest incremental cost:
Assume a 5% increase (applied to all costs).

13. Procurement Lead Times

The majority of the scope of work is cleanup and deconstruction, thus procurement of special items and special equipment will be minimal and should not pose an impact on cost or schedule. However, procurement of new subcontracts early in the project could pose a schedule delay. The potential is not considered significant and thus is not considered in the base.

14. Current Non-River Corridor Project Assumptions

The RCC contractor is dependent on other programs meeting their milestones so that the RCC contract can remain on schedule. For example, the Spent Nuclear Fuel (SNF) program must complete the cleanout and turnover of K Basins (scheduled to be complete by July 2007) before the RCC contractor can commence decommissioning activities of the K Basins. PNNL personnel in the 300 Area must be relocated to other facilities before the RCC contractor can begin decommissioning of the PNNL facilities. If any of these items are delayed, it could pose a cost and schedule risk to the RCC contract. However, such changes would be considered a change in scope and thus are not included in the analysis.

15. Bidding Climate / Contract Market

This refers to the competitiveness of subcontractors' bidding work and the resulting impact on the bid prices. Due to the size of the contract and subordinate subcontracts, this is assumed not to pose a cost or schedule risk.

16. Intervention by Outside Groups

This refers to possible intervention actions taken by the Defense Nuclear Facility Safety Board (DNFSB), and other stakeholders and Tribal Nations that could impact the cost and schedule of the project. Such changes would be considered a change in scope and thus are not included in the analysis.

17. Labor Bumping

During times when there are involuntary layoffs of workers, a trained but lower seniority employee can be laid off and replaced by a higher seniority employee who may require training for the particular work activity. This is a potential risk during the changeover period as the old contractor experiences staff reductions and will continue to be a risk during the life of the contract.

Labor Bumping Analysis and Assumptions

"Bargaining Unit" labor will be affected by labor bumping.

Lowest incremental cost: No additional costs ($0).

Incremental cost representing an 80% cumulative probability of not exceeding:
Not constrained, Allows the Risk Analysis distribution curve to determine 80% cumulative probability cost .

Highest incremental cost:
Assume 25 laborers per year are bumped resulting in an additional 5,000 hrs of training requirements at an average hourly rate of $50. 5,000 man-hours x $50 x 10 years = $2,500,000.

18. Other Problems

An additional factor is applied to account for the miscellaneous problems and delays that will occur on a program of this magnitude and from an area of this size. This factor is to cover problems in design, scheduling, communication breakdowns, site work restrictions, coordination, equipment breakdowns, etc.

Other Problems Analysis and Assumptions

"Exempt / Non-Exempt" labor will be increased to deal with the assortment of problems that will occur on a program of this magnitude.

Lowest incremental cost: No additional costs ($0).

Incremental cost representing an 80% cumulative probability of not exceeding:
Not constrained, Allows the Risk Analysis distribution curve to determine 80% cumulative probability cost.

Highest incremental cost:
An additional 12 months labor will be required to mitigate the problems. This results in an impact of 12 months over the 120 months total or 10% applied to "Exempt / Non-Exempt" labor costs.

Table 4.3 summarizes the ranges of the incremental cost impacts for risk variables used in the contingency analysis simulation. The results of the contingency analysis are included in Section 5.

Table 4.3: Risk Variable (External) Incremental Cost Impacts (Ranges)

DESCRIPTION	LOWEST ($)*	80% NOT TO EXCEED ($)	HIGHEST ($)
Workforce Productivity during Contractor Changeover	(5,253,913)	5,253,913	56,742,261
Ramp-up and Training of New Workforce	0	16,177,325	48,531,974
Availability of Specialized Equipment	(3,000,000)	3,000,000	7,000,000
Weather	0	27,501,452	55,002,903
Approval Turnaround Time	0	N/A	47,056,837
Commodities, Raw Materials, Wage Rates	(17,921,442)	N/A	89,607,209
Labor Bumping	0	N/A	2,500,000
Other Problems	0	N/A	56,694,984

* Lowest ($) are the amounts added to “Base Estimate Excluding Contingency” via Other Specific Adjustments. See Section 4.3.2, Specific Estimate Adjustments.

4.4.3 Estimated Uncertainty Range

The RCC Team utilized Crystal Ball™, to run simulations for developing the final base uncertainty. The uncertainty simulation included all individual baseline estimates and the external risk variables. For each individual site/facility activity an uncertainty range for the 50% and 80% confidence levels was determined. Risk factors were developed on a site/facility basis to provide greater visibility of the range of the uncertainty for each site/facility activity.

4.4.4 Contingency Analysis

The RCC Team utilized Crystal Ball™, to run simulations for developing the final base contingency. The contingency simulation included all individual base estimates and the external risk variables. The total base cost was further grouped into three distinct forecast categories to better represent the potential for cost variation based on the quality of the information available for a project and the historical cost experience for similar projects:

4) High-Risk Projects
5) Remaining Projects
6) Risk Variables (External)

Analysis was performed on a group rather than the individual site/facilities as done for the uncertainty range calculations. Table 4.4 depicts the results of the contingency analysis based on a representative sampling of data

Table 4.4: Contingency Simulation Results

Simulation	Risk Variables ($)	High Risk Projects ($)	% from Start	Remaining Projects ($)	% from Start	Totals ($)	% from Start
Starting Estimate	0	961,238,131		1,039,395,955		**2,000,634,086**	
0%	(8,069,001)	936,142,880	-2.61%	875,022,344	-15.81%	1,803,096,222	-9.87%
5%	38,674,375	1,169,850,609	21.70%	998,553,481	-3.93%	2,207,078,465	10.32%
10%	48,151,198	1,201,564,314	25.00%	1,019,671,026	-1.90%	2,269,386,537	13.43%
15%	54,785,394	1,222,429,985	27.17%	1,034,005,394	-0.52%	2,311,220,773	15.52%
20%	60,588,157	1,240,103,740	29.01%	1,045,714,804	0.61%	2,346,406,701	17.28%
25%	65,687,584	1,255,796,955	30.64%	1,056,000,067	1.60%	2,377,484,605	18.84%
30%	70,442,183	1,270,180,053	32.14%	1,064,833,075	2.45%	2,405,455,311	20.23%
35%	74,748,456	1,283,920,000	33.57%	1,072,870,643	3.22%	2,431,539,099	21.54%
40%	79,166,994	1,297,100,457	34.94%	1,080,970,794	4.00%	2,457,238,245	22.82%
45%	83,321,892	1,309,367,484	36.22%	1,088,617,062	4.74%	2,481,306,438	24.03%
50%	87,655,646	1,321,686,974	37.50%	1,096,187,708	5.46%	2,505,530,328	25.24%
55%	92,156,199	1,334,428,044	38.82%	1,103,784,902	6.19%	2,530,369,145	26.48%
60%	96,465,161	1,347,782,483	40.21%	1,111,628,835	6.95%	2,555,876,478	27.75%
65%	101,120,128	1,361,162,503	41.61%	1,119,799,543	7.74%	2,582,082,174	29.06%
70%	106,193,363	1,376,035,974	43.15%	1,128,472,359	8.57%	2,610,701,696	30.49%
75%	111,487,841	1,391,034,507	44.71%	1,137,768,974	9.46%	2,640,291,322	31.97%
80%	117,447,375	1,408,978,931	46.58%	1,148,217,417	10.47%	2,674,643,723	33.69%
85%	124,415,089	1,429,690,003	48.73%	1,160,558,200	11.66%	2,714,663,292	35.69%
90%	133,278,570	1,456,571,525	51.53%	1,174,644,159	13.01%	2,764,494,254	38.18%
95%	146,619,495	1,496,708,878	55.71%	1,195,675,188	15.04%	2,839,003,561	41.91%
100%	224,842,106	1,736,746,414	80.68%	1,316,465,567	26.66%	3,278,054,087	63.85%

Confidence Interval

Table 4.5 shows the actual contingencies used in the development of the RCC Independent Base Cost Estimate.

Table 4.5: Phase I, Contingency Analysis Results

Functions	Total	Confidence Level	Contingency Rate	Total w/ Contingency
Risk Variables	$ -	50%	0%	$ 45,000,000
High Risk Projects				
Deactivation	$ 132,521,291			
D&D - Decontamination and Decommissioning	$ 6,453,185			
Remediate Liquid Waste Sites	$ 24,231,303			
Remediate Burial Grounds	$ 277,850,059			
Remediate Waste Sites	$ 55,538,263			
totals	$ 496,594,101	80%	47.0%	$ 730,187,993
Remaining Projects				
Design	$ 3,977,707			
Mobilization and Demobilization	$ 2,032,611			
Deactivation	$ 1,717,604			
D&D - Decontamination and Decommissioning	$ 19,512,114			
Remediate Liquid Waste Sites	$ 8,958,034			
Remediate Waste Sites	$ 1,575,322			
Waste Operations	$ 160,345,088			
Surveillance & Maintenance	$ 135,867,515			
Interim Safe Storage	$ 18,614,249			
Regulation/ Regulatory and Support	$ 9,963,371			
Utilities & Infrastructure	$ 195,179			
Confirmatory Sampling Sites	$ 8,828,400			
Special Projects	$ 887,500			
Management & Support	$ 184,912,451			
totals	$ 557,387,145	80%	10.50%	$ 615,912,795
Phase I	$1,053,981,246			$ 1,391,100,789

Contingency Rate 32.0%

Table 4.6: Phase II, Contingency Analysis Results

Functions	Total	Confidence Level	Contingency Rate	Total w/ Contingency
Risk Variables	$ -	50%	0%	$ 42,000,000
High Risk Projects				
Deactivation	$ 96,052,560			
D&D - Decontamination and Decommissioning	$ 3,787,624			
Remediate Liquid Waste Sites	$ 8,746,366			
Remediate Burial Grounds	$ 91,625,412			
Remediate Waste Sites	$ 73,272,874			
Interim Safe Storage	$ 74,521,014			
totals	$ 348,005,850	80%	47%	$ 513,273,828
Remaining Projects				
Design	$ 2,179,882			
Mob & Demob	$ 871,614			
Deactivation	$ 84,074,250			
D&D - Decontamination and Decommissioning	$ 113,424,530			
Remediate Liquid Waste Sites	$ 305,442			
Remediate Waste Sites	$ 704,976			
Waste Operations	$ 158,340,774			
Surveillance & Maintenance	$ 12,172,156			
Regulation/ Regulatory & Sup	$ 1,985,342			
Utilities & Infrastructure	$ 11,584,117			
Confirmatory Sampling Sites	$ 3,389,929			
Management & Support	$ 150,203,396			
totals	$ 539,236,408	80%	11.40%	$ 600,709,359
Phase II	$ 887,242,258			$ 1,155,983,187

Contingency Rate 30%

4.5 RCC TECHNICAL FLOW

The purpose of the Technical Flow Diagram is to identify the scope and logical order of the work activities to be performed within the direct site closure functions of RA, Deactivation, D&D, and Waste Operations, and the interface with S&M. Each of these closure functions is sub-divided into discrete activities and organized according to technical workflow logic. These direct closure functions are also logically linked to each other to demonstrate the flow of work between functions.

The Technical Flow Diagram subdivides the four direct closure functions into more detailed activities. Each function contains several decision nodes that guide the user along various activity paths depending on the characteristics of the site, facility or waste stream in question. The diagram is flexible enough to consider any type of site or facility in the RCC project scope of work. While the Technical Flow Diagram is not detailed enough to use as a work plan by the RCC contractor, it does provide a comprehensive definition of the steps needed to complete the closure functions.

The technical basis for this diagram was compiled using several sources. The diagram structure evolved from the 300 Area ACP Flow Sheet. The functions were expanded to include more detailed scope definition and to accommodate the 100 Area closure and 600 Area closure. Expanded scope definition for RA, Deactivation, and D&D functions was derived from a thorough analysis of current contractor baseline cost models. The cost models subdivide each function into finite work activities with clearly defined crew, productivity, and scope assumptions. The Technical Flow Diagram does not include the same level of planning detail as is contained in the baseline cost models, but it summarizes those activities to an appropriate level so bidders on the RCC contract can understand the general work flow.

The Deactivation section of the diagram was refined by a review of the *Facility Deactivation Methods and Practices Handbook, Revision 1, August 20, 1999*. Cognizant technical DOE and contractor personnel provided further clarification to help relate the technical functions to each other and to define the Waste Operations function in more detail.

A copy of the “RCC Technical Flow” chart may be downloaded from the internet.

4.6 RCC CONTRACT TECHNICAL SEQUENCE

The purpose of the Technical Sequence Diagram is to show the schedule relationships between each zone of the RCC project. The diagram shows that closure activities can take place concurrently in the 100 and 300 Areas. The 100 and 300 Areas are depicted separately due to the differing extents of cleanup required and geographical considerations.

Within the 100 Area, the activities for each zone include the same categories of work: Remediate Liquid Sites, Remediate Burial Grounds, Remediate Waste Sites, and D&D (note that in the 100 Area of the models reviewed in the DWP, deactivation activities are included in the D&D estimates). This breakdown follows that from the Site Outcomes Baseline – Multi-Year Work Plan. The current contractor has already made significant progress with remediation activities and has placed the top priority on remediation of liquid sites in all zones. The placing of the remaining reactors into ISS is also included.

D&D commencement precedes remediation of waste sites and the activities can proceed concurrently. All remediation and D&D must be complete prior to zone closeout. This sequence diagram allows for D&D to occur simultaneously with remediation within any given 100 Area zone, so that the mix of waste going to the ERDF can be a combination of soils and building debris. This mix of waste streams allows for optimizing landfill space and meeting compaction requirements without the need to haul in clean soils.

The logic relationship between 100 Area zones allows for maximum flexibility. Multiple zones can be cleaned up at once. The contractor has the flexibility to cleanup each zone completely prior to proceeding to the next zone. Conversely, he may remediate liquid sites in each zone, then proceed to burial grounds and D&D in each zone, etc. This flexibility is necessary to allow the contractor to optimize waste stream flow into the ERDF.

In the 300 Area, the sequence follows that from the 300 Area ACP. It is assumed that a new utility corridor will be constructed to provide critical utilities to ongoing 300 Area facilities. Zone sequence is based on the early start of deactivation in each zone according to the 300 Area ACP schedule. Within each zone, deactivation is followed by infrastructure/utilities, D&D and remediation in that order. Unlike the 100 Area, the majority of the remediation activities must follow D&D, because most of the remediation will be required to cleanup the soil under existing structures. Again, the contractor has maximum flexibility to conduct zone closure activities to optimize waste streams. Zones may be cleaned up concurrently and there is no logic tie dictating any relationship between zone closeouts.

4.7 SCHEDULE DEVELOPMENT

The RCC schedule was generated based on the guidelines set forth by the RCC Team in the Technical Flow Diagram and the Summary Sheet. These diagrams presented typical work sequencing for the activities encompassed under the RCC contract scope of work. The basis of the work sequencing was established after reviewing existing on-site prioritization methods, the ACP plan schedule, and the MYWP current base schedule.
The development of the RCC contract schedule included the following steps:

- Analyze the scope of work and project requirements
- Segment the program or project into a reasonable number of activities that could be scheduled
- Estimate the time required to perform each activity
- Place the activities in time order, considering both sequential and concurrent performance
- Adjust the schedule to the specified completion date
- Level the resources to ensure they do not exceed availability

The WBS below the zone level was developed by the RCC Team to help show the responsibilities and deliverables required by the RCC contract. It is essentially a tool for providing cost and schedule information in identifiable and manageable units.

The WBS consists of the following levels:

A. River Corridor Restoration
B. Project Baseline Summary (PBS)
C. Zone
D. Function
E. Site/Facility

The RCC Team summarized cost information and schedule data at the function level. The functions involved are Confirmatory Sampling Sites, Design, Deactivation, D&D, Remediation, Waste Operations, Surveillance & Maintenance, Interim Safe Storage, Utilities & Infrastructure, Relocation, Management & Support, Special Projects, and Mobilization & Demobilization.

The next step in developing the base schedule was to determine the duration of functions for each Project Baseline Summary (PBS). Durations were estimated by utilizing the labor hours generated from the various cost models used to formulate the base estimate. Labor hours were drawn from three labor pools that currently work on the Hanford site: “Bargaining Unit”, Building Labor Trades (BLT), and “Exempt / Non-Exempt”. The RCC team determined the resource

that controlled the activity's duration by analyzing the proportions that these three resource pools contributed to an activity's cost. For the majority of the activities the "Bargaining Unit" hours were the critical factor for determining an activity's duration. This was due to the resource limit of available "Bargaining Unit" workforce trained in remediation work activities. In addition, the number of activities within a certain function was reviewed to determine how many crews could work concurrently. The models had varying crew sizes and composition for performing different functions like deactivation, D&D, remediation of sites, etc. The number of crews applied per function was determined based on the magnitude of the work being performed. The duration of an activity was calculated by dividing the total hours required for the activity by the number of crew hours required to perform each task. This duration was then applied to the schedule.

The next schedule iteration involved applying constraints, such as budget constraints, the "Bargaining Unit" personnel available for the project, and milestone constraints. A phased approach was taken that divided the schedule into two phases. The initial eight -year phase (FY03 – FY11) was limited to a budget of $190 million per year. It included a mix of high-risk and other projects as listed in the Phase I Work Scope of the RCC DRAFT RFP. Phase II was to be completed within 4 years but no later than FY 2012.

The results were checked for resource leveling issues and TPA milestone compliance. The results are documented in Section 5.

4.8 NOTES, QUALIFICATIONS, AND ASSUMPTIONS

This section highlights the assumptions made in developing the government estimate. These assumptions should not be construed as actual conditions that will be encountered by any potential bidder. Potential bidders should refer to the DRAFT RFP for specific conditions.

4.8.1 General Assumptions

1) The start date for the RCC contract is October 1, 2002. Transition activities commence July 1, 2002.
2) The RCC Base Cost Estimate contains no FY 2002 activities.
3) Contractor transition costs are not included in the RCC Base Cost Estimate.
4) The RCC Base Cost Estimate accounts for some potential loss of productivity due to contractor changeover.
5) The RCC contractor will write new procedures while work is in progress. This activity (writing of new procedures) will not hinder commencement or

progress of work underway or planned in the Current Year Work Plan (CYWP).

6) The new RCC contractor will understand "Government Requirements" for minimum staffing levels and other issues/requirements as opposed to "best commercial practice" only. In addition, clear and unambiguous specifications will be provided to the bidders.
7) Completion date for the contract is expected optimally to be September 30, 2012 but no later than the term of the RCC contract which is expected to be 15 years through September 30, 2017.
8) The new RCC contractor will have unconstrained access to the site. Work phasing will not be required other than coordination with planned personnel relocations in the 300 Area.
9) The RCC contractor will have sufficient space to place staging areas within close proximity of work sites.
10) All programs that interface with the RCC contract, and upon which the RCC contract is dependent upon to meet cost and schedule objectives, will meet their milestones. Examples include, but are not limited to, the Spent Nuclear Fuel (SNF) program (K Area) and relocation of Pacific Northwest National Laboratory (PNNL) personnel and facilities.

4.8.2 Labor Force Assumptions

1) The current workforce will continue with the new contractor. Upper management will be replaced. Segments of middle management and workers will remain and continue with work underway and planned in the Phase I scope of work.
2) FH workers currently performing deactivation in the 300 Area will be given the opportunity to be hired by the new contractor.
3) The new RCC contractor will sign the site labor agreement with all bargaining units. Strikes will not occur since they are prohibited by the site labor agreement.
4) The overall available workforce in the region is adequate. However, the new RCC contractor might have to compete with other site contractors for workers.
5) Current requirements for training will be maintained for all D&D and deactivation workers.
6) The HAMMER Training and Education Center will be a primary source of training.
7) Labor pricing is based on current labor rates given in signed agreements that "Bargaining Unit" and BLT have in place with the current prime contractors and subcontractors on the Hanford Site.

8) A 17% absence additional cost and a 34% continuity of service cost were added to all labor rates to obtain a fully burdened labor rate.
9) Composite rates were formulated for different job categories (ERC, "Bargaining Unit"), based on the anticipated usage of various worker classifications within each category.

4.8.3 Regulatory Assumptions

1) All TPA Milestones apply, will not be changed, and must be adhered to.
2) All current environmental compliance regulations (NEPA, RCRA, CERCLA, Historic Preservation Act, etc.) will be followed. Any change of regulation or change in "interpretation" of regulations may be a change in scope.
3) DOE/EPA/Ecology turnaround time on documents could pose a schedule risk for some projects.
4) All RODs and regulatory pathways for all major work elements except for N Reactor ISS are expected to be in place at the time of contract award.
5) Any changes due to stakeholder involvement were not included as part of the schedule development. These changes would have to be addressed on a case-by-case basis.

4.8.4 Site Services Assumptions

1) On-site sample analysis capacity is adequate and can support the RCC contractors' analysis requirements.
2) If sample turnaround time starts to impact project performance, the contractor will be able to augment the site sample analysis services with the use of mobile labs or other off-site sources.
3) The HAMMER Training and Education Center can support the necessary training requirements of the new RCC contract without impact to the schedule.
4) Other site services are adequate to support the project.
5) The RCC contractor will be allowed to supplement and/or replace any Site Services with outside sources if desired or necessary.

4.8.5 100 Area Scope Assumptions

1) ER and D&D scope is based on Site Outcomes Baseline Multi-Year Work Plan Volume 1 & 2.
2) 100 Area scope includes all yard piping (effluent, process sewer, etc.). An independent parametric estimate was prepared for remediation of reactor area yard pipe within the 100 Areas and included in the base estimate. Quantities were extrapolated from estimated lengths still remaining in the 100-B/C and 100-D Areas.

3) Cleanup methodology for remediation and D&D (construction activities, sequence, and waste percentages and volumes) is based on the MCACES models.
4) Specialized equipment for D&D is limited on-site. Additional equipment may be needed to perform multiple D&D jobs in parallel.
5) Deactivation work to be performed in the 100 Area is included in the D&D estimates, except for K-Area.
6) D&D work in Zone 6 cannot begin until the SNF Project completes all K Basin fuel removal and deactivation activities. The SNF activities are scheduled to be completed by July 2007. This is a constraint due to interface with the SNF Project.
7) D&D and "Remediate Waste Sites" may occur concurrently such that contaminated soil will be hauled with D&D debris to the ERDF in order to meet compaction requirements. D&D must be finished before all soil remediation is complete.
8) Mobilization and demobilization for remedial action work will be accounted for per zone, not per facility. RA mobilization and demobilization is accounted for one or two each in each zone in the 100 Area and two each in the 300 Area. Trailers are available on-site at no rental charge to the RCC contractor. Mobilization and demobilization costs are distributed among the D&D estimates for each facility.
9) The observational approach for sampling during RA will be used instead of pre-site characterization.
10) Sample analysis costs excluding escalation, a primary cost driver to remediation, will remain stable during the life of the contract.
11) Off-site treatment and disposal of potential drummed liquids encountered during burial ground remediation is not included in the 100 Area. Any land-banned waste encountered can be stabilized (grouted) on-site and disposed in the ERDF.

4.8.6 300 Area Scope Assumptions

1) Deactivation scope for the 300 Area is based on the POWERtool estimates supporting the 300 Area ACP.
2) Due to the more limited geographical area of the 300 Area, one mobilization's for remedial action work will occur per phase.
3) Relocation costs of personnel impacted by the vacating of facilities are not part of the RCC contractor scope. Personnel will be notified when buildings must be turned over to the RCC contractor per the requirements in the contract. Other contractors will cover relocation costs.

4) General sequence for cleanup per each zone of the 300 Area will be to perform deactivation, proceed to D&D, and then finish with cleanup of remaining remedial action sites. D&D and remediation may progress as parallel activities. Startup of burial grounds cleanup in the 300 Area will not be constrained within the schedule, thus allowed to startup and work concurrently where possible.
5) Deactivation work will begin in Zones H and K first because work is currently being performed in those Zones.
6) Conversion of Building 3706 to a temporary construction facility (part of Zone G) is included in the base estimate.
7) For the 300 Area buildings, the utilities and infrastructure function (disconnection activities) is completed simultaneously with deactivation.
8) The deactivation procedures are based on the *DOE/EM-0318 Facility Deactivation Methods and Practices Handbook*, and current Hanford guidelines.
9) Off-site treatment and disposal of potential drummed liquids encountered during burial ground remediation is included in the 300 Area. Any land-banned waste encountered can be stabilized (grouted) on-site and disposed in the ERDF.

4.8.7 Waste Disposal Assumptions

1) The new RCC contractor is responsible for the ERDF operation.
2) The approximate maximum annual disposal capacity of the ERDF is 700,000 tons.
3) The daily transportation and disposal capacity for the ERDF can accommodate the cleanup production rate required for the RCC contract.
4) The ERDF will accept all hazardous, low level, and mixed waste encountered during the contract.
5) Any TRU waste, spent fuel, Polychlorinated Biphenyls (PCB's) greater than 50 parts per million, or other untreated Land Disposal Restriction (LDR) waste will be sent to a site other than the ERDF. Costs for disposal of said wastes will constitute a change of scope.
6) All general construction debris and municipal solid waste will be sent to municipal landfills instead of the ERDF.
7) Excluding escalation, the ERDF disposal costs will remain stable during the life of the contract.

4.8.8 Project Management and Support Assumptions

1) The PM&S costs are applied to individual PBS levels based on the amount and costs associated with the work activities.

2) Newly issued or significantly revised regulations (e.g., 10 [Code of Federal Regulations] CFR 834) may render a change in scope to the RCC contractor.
3) The PM&S costs are based on historical levels of oversight for project work and site support activities.
4) The current DOE required deliverables or reports would remain the same for the duration of the RCC Contract.
5) PM&S costs, including deactivation PM&S, are based on the current BHI Program Management and Support structure.
6) Project management costs that are directly associated with a specific project are included in the individual facility estimates. However, PM&S costs for more global (common) activities are included in this separate account rather than activities specific to the projects.

4.8.9 Direct Distributables, Indirect and Operating Centers Assumptions

1) The direct distributables were applied as a percentage to the overall direct cost of the RCC project.
2) During the contract period, the direct distributable percentage remains fixed. The current operations on the Hanford site contain the cost centers listed below. In reviewing the scope of work for the RCC contract, it was decided that operations would be similar to existing conditions. These direct distributable, indirect and operating centers include Automation, Light Vehicles, Reprographics, Office Services and Supplies, Graphics, Commercial/Government Printing Office, Technical Publications, Facilities, Word Processing, Heavy Equipment, and Communications and Mail Services. Also included are the following:
    - The “Exempt / Non-Exempt” Project’s share of Site-Wide Services.
    - Laundering of the “Exempt / Non-Exempt” Project’s protective clothing and equipment by Interstate Nuclear Services (INS).
    - Electricity provided by the Bonneville Power Administration (BPA).
    - The “Exempt / Non-Exempt” Project’s share of Service Assessment Pool activities (e.g., Hanford Energy Management Program, court reporter fees, Command Information Center costs).
    - The “Exempt / Non-Exempt” Project’s use of the PNNL technical library and reading room.
    - The “Exempt / Non-Exempt” Project’s share of Benton County Sheriff’s Office policing of the Hanford Site.
    - Natural Resource Damage Assessment (NRDA) studies and ecosystems management.
    - Miscellaneous “Exempt / Non-Exempt” Project support activities.

- Regulatory oversight by Ecology.

5. RESULTS

5.1 RCC BASE COST ESTIMATE

The overall RCC Team Independent Base Cost Estimate results are presented in detail in the following Tabs:

Tab 2 RCC Base Cost Estimate Report, Summary by PBS and Zone
Tab 3 RCC Base Cost Estimate Report, Summary by Zone and Function
Tab 4 RCC Base Cost Estimate Report, Summary by Site / Facility Activity

The overall costs represent the following:

- **RCC Base Cost Estimate (includes Phase I and Phase II)**. The Base Cost estimate assumes $190M per year funding level over eight years for Phase I. Notwithstanding the offerors providing an optimum case, Phase II project completion was assumed to be within 4 years but no later than FY 2012. Total Project Cost, including allowances for uncertainties and external variables (referred to cumulatively, for purposes of this report, as "contingency") is equal to $2,760,967K at the 80% confidence level ($1,509,512K for Phase I and $1,251,455K for Phase II).

5.2 RCC Base SCHEDULE

The Base Schedule included in Tab 1 was completed based on potential funding availability:

Phase I: $190 million/year for eight years
Phase II: Funding Level required for project completion within four years but not later than FY 2012

Observations

- The step-change in funding for Phase I to Phase II results in a tremendous increase in the workforce that may not be readily achievable.
- D&D activities are distributed across Phase I. This results in a mix of concrete and remedial wastes that should meet the compaction requirements at the ERDF.

- All currently negotiated TPA milestones applicable to the River Corridor are achievable.

ACRONYMS

ACP	Accelerated Closure Project
ALARA	As Low As Reasonably Achievable
BHI	Bechtel Hanford, Inc.
BLT	Building Labor Trades
BPA	Bonneville Power Administration
CA	Cost Analysis
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act of 1980
CFR	Code of Federal Regulations
CQS&H	Compliance, Quality, Safety and Health
CYWP	Current Year Work Plan
D&D	Decontamination, Decommissioning and Demolition
D^4	Deactivation + D&D (Decontamination, Decommissioning and Demolition)
DNFSB	Defense Nuclear Facilities Safety Board
DOE-RL	U.S. Department of Energy, Richland Operations Office
DWP	Detailed Work Plan
EE/CA	Engineering Evaluation/Cost Analysis
EF	External Factors
EM	Environmental Management
EPA	Environmental Protection Agency
ER	Environmental Restoration
ERC	Environmental Restoration Contractor
ERDF	Environmental Restoration Disposal Facility
FH	Fluor Hanford
FY	Fiscal Year
G&A	General and Administrative
GSF	Gross Square Feet
HAMMER	Hazardous Material Management and Emergency Response
HAMTC	Hanford Atomic Metal Trades Council

HGET	Hanford General Employee Training
INS	Interstate Nuclear Services
ISS	Interim Safe Storage
LDR	Land Disposal Restriction
LLW	Low Level Waste
MCACES	Micro-Computer Aided Cost Estimating System
Mhrs	Manual Hours
MYWP	Multi-Year Work Plan
NEPA	National Environmental Policy Act
NMhrs	Non-Manual Hours
NPL	National Priority List
NRDA	Natural Resource Damage Assessment
NSS	Non-Site Specific
ORP	Office of River Protection
OU	Operable Unit
PBS	Project Baseline Summary
PCB	Polychlorinated Biphenyls
PM&S	Project Management and Support
PNNL	Pacific Northwest National Laboratories
PT&C	Project Time & Cost, Inc.
RA	Remedial Action
RCC	River Corridor Closure
RCRA	Resource Conservation and Recovery Act of 1976
RFP	Request for Proposal
ROD	Record of Decision
S&M	Surveillance and Maintenance
SNF	Spent Nuclear Fuel
TPA	Tri-Party Agreement
TRU	Transuranic
USACE	U.S. Army Corps of Engineers
WBS	Work Breakdown Structure